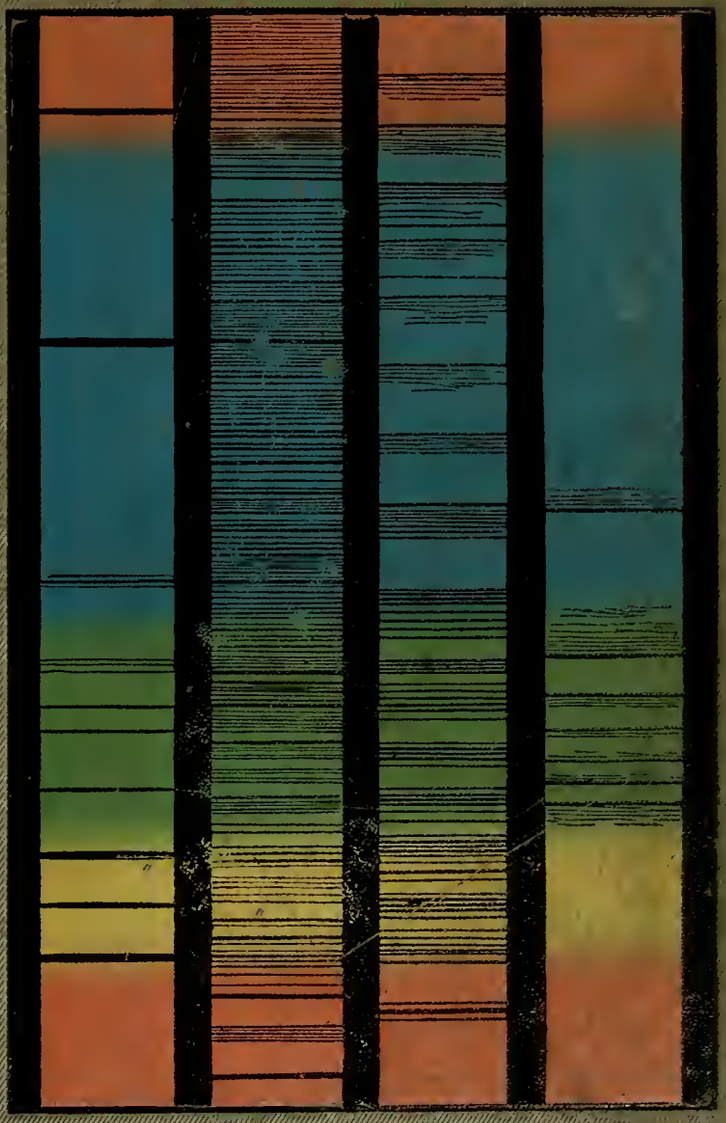
STAR ATLAS



WITH EXPLANATORY TEXT
BY
Dr. HERMANN J. KLEIN.

TRANSLATED AND BROUGHT UP TO DATE
BY
EDMUND McCLURE M.A. M.R.I.A. F.L.S.

LONDON:
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NEW YORK: E. & J. B. YOUNG & Co.
1893.

Read;-to better read
Life-Nature-all things.
MHu
Ex
Libris

STAR ATLAS

CONTAINING

Maps of all the Stars from 1 to 6.5 Magnitude between the North Pole and 34° South Declination, and of all Nebulæ and Star Clusters in the same region which are visible in telescopes of moderate powers.

With Explanatory Text

BY

DR. HERMANN J. KLEIN.

TRANSLATED, AND BROUGHT UP TO DATE

BY

EDMUND McCLURE, M.A., M.R.I.A., F.L.S.

WITH EIGHTEEN MAPS.

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NOTICE OF THE TRANSLATOR TO THE SECOND ENGLISH EDITION.

THE Translator has in this second English Edition endeavoured to bring up to date Dr. Klein's descriptions of the more interesting Fixed Stars, Star Clusters, and Nebulæ. All additional matter has been included in brackets, or appended as notes. While anything like completeness has not been aimed at, the Translator has examined records of the most recent researches with the view of furnishing such further details as may be helpful to the student. The notice of the recently discovered *Nova* in *Auriga* [p. 25 and Note to p. iii.] is not the least important among those which have been added, and it is of further interest from the fact that the discovery was made by the aid of this "Star Atlas." The discoverer writing to *Nature*, February 18th, 1892, says:—"You might also allow me to state, for the benefit of your readers, that my case is one that can afford encouragement to even the humblest amateurs. My knowledge of the technicalities of Astronomy is, unfortunately, of the meagrest description; and all the means at my disposal on the morning of the 31st ult., when I was sure that a strange body was present in the sky, were Klein's 'Star Atlas' and a small pocket telescope which magnifies ten times."

October, 1892.

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65
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* The R.A. and D. of this star are of the date of discovery. To the description given on p. 25 ought to be added the fact that Mr. Espin estimated Nova to be, on August 21, 9·2 mag.; Mr. Freeman, on August 28, at 10·1. On September 1, it was estimated at South Kensington as fainter than a 10th mag. star.

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INTRODUCTION.

1.

THE starry heaven seems to an observer to be a hollow sphere of which one-half lies above and the other below the horizon. The stars seem to be attached to this hollow sphere, and to make with it a daily revolution around the earth. To fix the position of any of the heavenly bodies upon the celestial vault, certain imaginary lines are made use of. The principal lines employed for this purpose correspond with the parallels of latitude and meridians of longitude upon the sphere of the earth, and give the Right Ascension (longitude) and Declination (latitude) of all heavenly bodies. As the meridians of longitude are reckoned eastwards round the earth from a conventionally fixed meridian (Greenwich), and divide the circumference of the earth into 360°, so the celestial sphere is similarly divided by the meridians of Right Ascension, which start from the first point of Aries, and reckoned in an eastward direction, divide the celestial equator into 360°. Further, as places on the earth north or south of the terrestrial equator are reckoned by degrees of latitude up to 90° towards either pole, so the Declination of heavenly bodies is reckoned in degrees north or south of the celestial equator to the northern or southern celestial poles, which have each 90° of Declination. Thus, just as one is enabled to determine the position of a spot upon the earth by its latitude and longitude, so one can find on the celestial sphere the place of a heavenly body by its Right Ascension and Declination.

The term Right Ascension is expressed shortly by R.A., and Declination by D, which by the addition of the + sign is further meant to designate northerly Declination, and by the sign — southerly Declination.

The time required for a complete revolution of the celestial sphere is called a Sidereal day, This day begins at the instant in which the first point of Aries passes the meridian of the place of observation. The sidereal day is divided into 24 hours. (Numbered 1, 2, 3,—to 24), each hour into 60 minutes, each minute into 60 seconds.

The sidereal day is $3^m\ 55{\cdot}9^s$ shorter than the mean solar day, and, therefore, the first point of Aries, or any fixed star, passes the meridian daily about four minutes earlier than it did the day previously. The beginning of the sidereal day is not, therefore, fixed to any definite hour of mean time, but during the year runs through all the hours of the civil day. As the sidereal day is about four minutes shorter than the mean solar day, so the hours and minutes of the sidereal day are shorter than the corresponding periods of the civil day, as this table shows:

Hours.		Minutes.			
Sidereal Time = Mean Time.		Sidereal Time = Mean Time.		Sidereal Time = Mean Time.	
1^h	$0^h\ 59^m\ 50^s$	1	$0^m\ 59.8^s$	20	$19^m\ 56.7^s$
2	1 59 40	2	1 59.7	30	29 55.1
3	2 59 31	3	2 59.5	40	39 53.6
4	3 59 21	4	3 59.3	50	49 52.0
5	4 59 11	5	4 59.2	60	59 50.2
6	5 59 1	6	5 59.0		
7	6 58 51	7	6 58.9		
8	7 58 41	8	7 58.7		
9	8 58 31	9	8 58.5		
10	9 58 21	10	9 58.4		
20	19 56 43				
24	23 56 4				

If on any day the first point of Aries, of which the R.A. is 0°, passes the meridian of an observer at noon, an hour after noon a point of the heaven of R.A. 15° will be on the meridian, after two hours a point of R.A. 30°, after three hours a point of 45°, etc. The Right Ascension of a star, or its distance from the first point of Aries, instead of being expressed in degrees, can thus be indicated by the number of hours, minutes, and seconds, which have elapsed from the time of culmination of the first point of Aries until the time this star passes the meridian, or culminates. Thus instead of expressing the Right Ascension of the bright star Vega by 277° 30′ we may say that it amounts to 18 30^m. For, as 360° pass the meridian in 24 hours, in one hour 15° will pass, and in 1 time minute 15 minutes of arc, and in 1 time second, 15 arc seconds. Thus 277° 30′ turned into time are equal to 18^h 30^m.

In many star maps Right Ascension is expressed in degrees of an arc only. The practice of astronomers, however, without exception, is to reckon the R.A. in time only. Therefore in the present atlas the parallels for Right Ascension are given in hours and parts of an hour.

In case it is required to turn time into arc measurement, the following table will readily serve the purpose.

Table for Turning Sidereal Time into Degrees.

Hours.	Degrees.	Minutes.	Degrees.	Minutes.	Degrees.
1^h	15°	1^m	0° 15′	31^m	7° 45′
2	30	2	0 30	32	8 0
3	45	3	0 45	33	8 15
4	60	4	1 0	34	8 30
5	75	5	1 15	35	8 45
6	90	6	1 30	36	9 0
7	105	7	1 45	37	9 15
8	120	8	2 0	38	9 30
9	135	9	2 15	39	9 45
10	150	10	2 30	40	10 0
11	165	11	2 45	41	10 15
12	180	12	3 0	42	10 30
13	195	13	3 15	43	10 45
14	210	14	3 30	44	11 0
15	225	15	3 45	45	11 15
16	240	16	4 0	46	11 30
17	255	17	4 15	47	11 45
18	270	18	4 30	48	12 0
19	285	19	4 45	49	12 15
20	300	20	5 0	50	12 30
21	315	21	5 15	51	12 45
22	330	22	5 30	52	13 0
23	345	23	5 45	53	13 15
24	360	24	6 0	54	13 30
		25	6 15	55	13 45
		26	6 30	56	14 0
		27	6 45	57	14 15
		28	7 0	58	14 30
		29	7 15	59	14 45
		30	7 30	60	15 0

2.

The sidereal day begins, as already mentioned, at the instant in which the first point of Aries passes the meridian of the observer. The Sidereal time at any moment is therefore equal to the distance, expressed in time of the first point of Aries westwards from the meridian ; in

Table for Turning Degrees into Sidereal Time.

Degrees.

	0°		1°		2°		3°		4°		5°		6°		7°		8°		9°	
	h	m	h	m	h	m	h	m	h	m	h	m	h	m	h	m	h	m	h	m
0°	0	0	0	4	0	8	0	12	0	16	0	20	0	24	0	28	0	32	0	36
10	0	40	0	44	0	48	0	52	0	56	1	0	1	4	1	8	1	12	1	16
20	1	20	1	24	1	28	1	32	1	36	1	40	1	44	1	48	1	52	1	56
30	2	0	2	4	2	8	2	12	2	16	2	20	2	24	2	28	2	32	2	36
40	2	40	2	44	2	48	2	52	2	56	3	0	3	4	3	8	3	12	3	16
50	3	20	3	24	3	28	3	32	3	36	3	40	3	44	3	48	3	52	3	56
60	4	0	4	4	4	8	4	12	4	16	4	20	4	24	4	28	4	32	4	36
70	4	40	4	44	4	48	4	52	4	56	5	0	5	4	5	8	5	12	5	16
80	5	20	5	24	5	28	5	32	5	36	5	40	5	44	5	48	5	52	5	56
90	6	0	6	4	6	8	6	12	6	16	6	20	6	24	6	28	6	32	6	36
100	6	40	6	44	6	48	6	52	6	56	7	0	7	4	7	8	7	12	7	16
110	7	20	7	24	7	28	7	32	7	36	7	40	7	44	7	48	7	52	7	56
120	8	0	8	4	8	8	8	12	8	16	8	20	8	24	8	28	8	32	8	36
130	8	40	8	44	8	48	8	52	8	56	9	0	9	4	9	8	9	12	9	16
140	9	20	9	24	9	28	9	32	9	36	9	40	9	44	9	48	9	52	9	56
150	10	0	10	4	10	8	10	12	10	16	10	20	10	24	10	28	10	32	10	36
160	10	40	10	44	10	48	10	52	10	56	11	0	11	4	11	8	11	12	11	16
170	11	20	11	24	11	28	11	32	11	36	11	40	11	44	11	48	11	52	11	56
180	12	0	12	4	12	8	12	12	12	16	12	20	12	24	12	28	12	32	12	36
190	12	40	12	44	12	48	12	52	12	56	13	0	13	4	13	8	13	12	13	16
200	13	20	13	24	13	28	13	32	13	36	13	40	13	44	13	48	13	52	13	56
210	14	0	14	4	14	8	14	12	14	16	14	20	14	24	14	28	14	32	14	36
220	14	40	14	44	14	48	14	52	14	56	15	0	15	4	15	8	15	12	15	16
230	15	20	15	24	15	28	15	32	15	36	15	40	15	44	15	48	15	52	15	56
240	16	0	16	4	16	8	16	12	16	16	16	20	16	24	16	28	16	32	16	36
250	16	40	16	44	16	48	16	52	16	56	17	0	17	4	17	8	17	12	17	16
260	17	20	17	24	17	28	17	32	17	36	17	40	17	44	17	48	17	52	17	56
270	18	0	18	4	18	8	18	12	18	16	18	20	18	24	18	28	18	32	18	36
280	18	40	18	44	18	48	18	52	18	56	19	0	19	4	19	8	19	12	19	16
290	19	20	19	24	19	28	19	32	19	36	19	40	19	44	19	48	19	52	19	56
300	20	0	20	4	20	8	20	12	20	16	20	20	20	24	20	28	20	32	20	36
310	20	40	20	44	20	48	20	52	20	56	21	0	21	4	21	8	21	12	21	16
320	21	20	21	24	21	28	21	32	21	36	21	40	21	44	21	48	21	52	21	56
330	22	0	22	4	22	8	22	12	22	16	22	20	22	24	22	28	22	32	22	36
340	22	40	22	44	22	48	22	52	22	56	23	0	23	4	23	8	23	12	23	16
350	23	20	23	24	23	28	23	32	23	36	23	40	23	44	23	48	23	52	23	56

Minutes.

	0′		1′		2′		3′		4′		5′		6′		7′		8′		9′	
	m	s	m	s	m	s	m	s	m	s	m	s	m	s	m	s	m	s	m	s
0′	0	0	0	4	0	8	0	12	0	16	0	20	0	24	0	28	0	32	0	36
10	0	40	0	44	0	48	0	52	0	56	1	0	1	4	1	8	1	12	1	16
20	1	20	1	24	1	28	1	32	1	36	1	40	1	44	1	48	1	52	1	56
30	2	0	2	4	2	8	2	12	2	16	2	20	2	24	2	28	2	32	2	36
40	2	40	2	44	2	48	2	52	2	56	3	0	3	4	3	8	3	12	3	16
50	3	20	3	24	3	28	3	32	3	36	3	40	3	44	3	48	3	52	3	56

other words it is equal to the R.A. of the point of the celestial sphere then passing the meridian. Conversely the Right Ascension of a fixed star expressed in hours and parts of an hour is equal to the sidereal time of its passage through the meridian.

In most cases the observer requires to find out the mean or civil time of the place in which he is at the moment when a certain star, whose Right Ascension is given, is on the Meridian. This can easily be ascertained with the help of the following table, which gives the *approximate* sidereal time of mean noon for every day in the year. If the *exact* sidereal time be required, the Nautical Almanack for the year must be consulted.

Sidereal Time at the moment of Mean Noon.

Day of the Month.	January	February	March	April	May	June	July	August	September	October	November	December	Day of the Month.
	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	
1	18 45	20 47	22 38	0 40	2 38	4 41	6 39	8 41	10 43	12 42	14 44	16 42	1
2	18 49	20 51	22 42	0 44	2 42	4 44	6 43	8 45	10 47	12 45	14 48	16 46	2
3	18 53	20 55	22 46	0 48	2 46	4 48	6 47	8 49	10 51	12 49	14 52	16 50	3
4	18 57	20 59	22 50	0 52	2 50	4 52	6 51	8 53	10 55	12 53	14 56	16 54	4
5	19 1	21 3	22 54	0 56	2 54	4 56	6 55	8 57	10 59	12 57	15 0	16 58	5
6	19 5	21 7	22 58	1 0	2 58	5 0	6 59	9 1	11 3	13 1	15 3	17 2	6
7	19 9	21 11	23 1	1 4	3 2	5 4	7 2	9 5	11 7	13 5	15 7	17 6	7
8	19 13	21 15	23 5	1 8	3 6	5 8	7 6	9 9	11 11	13 9	15 11	17 10	8
9	19 17	21 19	23 9	1 12	3 10	5 12	7 10	9 13	11 15	13 13	15 15	17 14	9
10	19 21	21 23	23 13	1 16	3 14	5 16	7 14	9 17	11 19	13 17	15 19	17 18	10
11	19 25	21 27	23 17	1 19	3 18	5 20	7 18	9 20	11 23	13 21	15 23	17 21	11
12	19 29	21 31	23 21	1 23	3 22	5 24	7 22	9 24	11 27	13 25	15 27	17 25	12
13	19 33	21 35	23 25	1 27	3 26	5 28	7 26	9 28	11 31	13 29	15 31	17 29	13
14	19 36	21 39	23 29	1 31	3 30	5 32	7 30	9 32	11 35	13 33	15 35	17 33	14
15	19 40	21 43	23 33	1 35	3 34	5 36	7 34	9 36	11 38	13 37	15 39	17 37	15
16	19 44	21 47	23 37	1 39	3 37	5 40	7 38	9 40	11 42	13 41	15 43	17 41	16
17	19 48	21 51	23 41	1 43	3 41	5 44	7 42	9 44	11 46	13 45	15 47	17 45	17
18	19 52	21 54	23 45	1 47	3 45	5 48	7 46	9 48	11 50	13 49	15 51	17 49	18
19	19 56	21 58	23 49	1 51	3 49	5 52	7 50	9 52	11 54	13 52	15 55	17 53	19
20	20 0	22 2	23 53	1 55	3 53	5 55	7 54	9 56	11 58	13 56	15 59	17 57	20
21	20 4	22 6	23 57	1 59	3 57	5 59	7 58	10 0	12 2	14 0	16 3	18 1	21
22	20 8	22 10	0 1	2 3	4 1	6 3	8 2	10 4	12 6	14 4	16 7	18 5	22
23	20 12	22 14	0 5	2 7	4 5	6 7	8 6	10 8	12 10	14 8	16 10	18 9	23
24	20 16	22 18	0 8	2 11	4 9	6 11	8 9	10 12	12 14	14 12	16 14	18 13	24
25	20 20	22 22	0 12	2 15	4 13	6 15	8 13	10 16	12 18	14 16	16 18	18 17	25
26	20 24	22 26	0 16	2 19	4 17	6 19	8 17	10 20	12 22	14 20	16 22	18 21	26
27	20 28	22 30	0 20	2 23	4 21	6 23	8 21	10 24	12 26	14 24	16 26	18 25	27
28	20 32	22 34	0 24	2 26	4 25	6 27	8 25	10 27	12 30	14 28	16 30	18 28	28
29	20 36		0 28	2 30	4 29	6 31	8 29	10 31	12 34	14 32	16 34	18 32	29
30	20 40		0 32	2 34	4 33	6 35	8 33	10 35	12 38	14 36	16 38	18 36	30
31	20 43		0 36		4 37		8 37	10 39		14 40		18 40	31

For instance, if it be required to find out at what hour of the day on the 15th April, the Star Castor, whose Right Ascension is $7^h\ 27^m$, is on the Meridian:

Sidereal time of Meridian passage = Right Ascension = $7^h\ 27^m$
Sidereal time at mean noon on 15th April . . . . = $1^h\ 35^m$

Difference: $5^h\ 52^m$

It must be borne in mind that the difference is expressed in sidereal hours, 24 of which are $3^m\ 55.9^s$ shorter than 24^h of mean time. It follows, therefore, that $5^h\ 52^m$ sidereal time are 57^s, or speaking roughly, 1^m shorter than the corresponding mean time, and this must be subtracted from the result given above. Castor will therefore be on the Meridian at $5^h\ 51^m$.

Constellations and the Names of Stars.

Already in the earliest ages the chief fixed stars had received names, and many configurations, fancifully representing natural or mythical objects, were grouped into constellations. In the 16th century, when more exact information had been obtained with regard to the southern heavens, constellations were duly marked out there also; nay, even in the last century several new constellations were added to the number, and introduced into astronomical maps. That there was no great resemblance between the constellations and the objects whose names they bore, it is needless to say. The practice which obtained in the old star-atlases, of surrounding the stars composing a constellation with an outline of the person or object which the constellation was supposed to represent, was, therefore, purely fanciful. Until quite recently the greatest uncertainty prevailed, not only with regard to the boundaries, but even as to the number of the constellations. It was finally, however, decided that only those constellations should be recognised which are to be found in Argelander's *Neue Uranometrie*.

The present atlas will therefore be found to contain only those constellations which are given by Argelander, the fantastic figures suggested by their names being omitted.

The following is a list of the constellations visible from our hemisphere, which are to be found in Argelander's *Uranometrie*.

Andromeda, Andromeda.
Aquarius, The Water-carrier.
Aquila, The Eagle.
Argo navis, The Ship Argo.
Aries, The Ram.
Auriga, The Waggoner.
Bootes, Bootes.
Camelopardalis, The Giraffe.
Cancer, The Crab.
Canes venatici, The Hounds.
Canis major, The Great Dog.
Canis minor, The Little Dog.
Capricornus, The Goat.
Cassiopeia, Cassiopeia.
Centaurus, The Centaur.
Cepheus, Cepheus.
Cetus, The Whale.
Columba, The Dove.
Coma Berenices, The Hair of Berenice.
Corona borealis, The Northern Crown.
Corvus, The Crow.
Crater, The Cup.
Cygnus, The Swan.
Delphinus, The Dolphin.
Draco, The Dragon.
Equuleus, The Foal.
Eridanus, The River Eridanus.
Gemini, The Twins.
Hercules, Hercules.
Hydra, The Hydra.
Lacerta, The Lizard.
Leo, The Lion.

Leo minor, The Little Lion.
Lepus, The Hare.
Libra, The Balance.
Lupus, The Wolf.
Lynx, The Lynx.
Lyra, The Lyre.
Monoceros, The Unicorn.
Ophiuchus, Ophiuchus.
Orion, Orion.
Pegasus, Pegasus.
Perseus, Perseus.
Pisces, The Fish.
Piscis australinus, The Southern Fish.
Sagitta, The Arrow.
Sagittarius, The Archer.
Scorpio, The Scorpion.
Scutum Sobieski, The Shield of Sobieski.
Serpens, The Serpent.
Sextans, The Sextant.
Taurus, The Bull.
Triangulum, The Triangle.
Ursa major, The Great Bear.
Ursa minor, The Little Bear.
Virgo, The Virgin.
Vulpecula, The Little Fox.

The stars of the greatest magnitude in each constellation were in former times distinguished by individual names. Thus, the star of the greatest magnitude in the Great Dog is called *Sirius;* the star of the greatest magnitude in the Waggoner is called *Capella*, and so on. At the present day, however, the individual stars in each constellation are indicated by letters of the Greek or Latin alphabet in accordance with a system introduced by Bayer. Thus *Sirius* is described as α in the Great Dog, *Rigel* as β in Orion. The lesser stars are generally indicated by the numbers assigned to them in a catalogue, in which their positions are given by their Right Ascension and Declination. The catalogue most generally in use for stars which are visible to the naked eye, is that of the second edition of Flamsteed's *Historia Cœlestis* which appeared in 1725. The figures affixed to the majority of the stars in the present work are those of Flamsteed. At the same time, there are many stars faintly visible to the naked eye which have not been catalogued by either Bayer or Flamsteed. These stars are to be found in other catalogues, but they are not specially numbered in this atlas, except where they occur in Struve's catalogue of Double stars. In the case of these stars, the number assigned to each in Struve's catalogue has been inserted, the letter Σ being prefixed.

Magnitudes of the Stars.

The stars are divided into various classes of magnitude according to their apparent brilliancy; thus the most brilliant stars are said to be of the first magnitude; the least brilliant of those that can be discerned by the naked eye on a clear night are said to be of the sixth magnitude. The arrangement of all the stars visible to the naked eye into these six magnitudes is principally based on the estimates formed by Argelander, Heis, Behrmann, Gould, and Houzeau. Light measurements recently carried out by the aid of photometrical apparatus have proved that the estimate of magnitudes by Argelander's method is fairly trustworthy, and that in general, for the stars visible to the naked eye, each succeeding magnitude after the first indicates the possession of two-fifths of the light of the preceding one.

By the aid of the telescope, and according to its optical powers, stars of still lower magnitude become visible. According to test experiments, a telescope with an objective glass of $\frac{1}{2}$ an inch aperture will show stars of the 7th magnitude. An objective of 1 in., stars of the 9th magnitude; one of 2 in., stars of $10\frac{1}{2}$ magnitude; one of 3 in., stars of the 11th magnitude; one of 4 in., stars of $11\frac{1}{2}$ magnitude; of 5 in., those of the 12th magnitude; of 6 in., those of $12\frac{1}{2}$ magnitude, &c., &c.

It is to be remarked, however, that the estimation of the magnitude of faint stars is very uncertain. Thus Struve designates the faintest companions of double stars which he could see through the 12-inch refracting telescope of Dorpat as of the 12th magnitude, which according to Argelander's scale would be of the 14th magnitude, and judged by John Herschel would be classified with stars of the 20th magnitude. These discrepancies among observers are not very perceptible in regard to stars up to the 10th magnitude, and they may therefore be disregarded by observers who employ telescopes of only moderate power.

Number of the Fixed Stars.

The most cursory survey of the heavens shows that, generally, the fainter the stars are, the more numerous they appear. From Argelander's observations it appears that in the celestial sphere north of the equator there are

Stars 1 to 6.5 Magnitude = 4120		Stars 7.6 to 8.0 Magnitude = 11168	
,, 6.6 ,, 7.0 ,, = 3887		,, 8.1 ,, 8.5 ,, = 22898	
,, 7.1 ,, 7.5 ,, = 6054		,, 8.6 ,, 9.0 ,, = 52852	

Stars 9.1 to 9.5 Magnitude = 213973.

Beyond the 9.5 magnitude the stars increase in number so much that it is no longer possible to observe them individually or to number them. The desire and the need to place upon our star maps the faintest stars, has in the meantime led to the employment of photography for the purpose, and as a result we are now able to map out the celestial spaces and to give therein stars which approach and even exceed the visibility in our greatest telescopes.

The first experiments in this line attended by successful results were carried out at the Paris Observatory by the brothers Henri. With the aid of an object glass of 6 in. aperture, expressly constructed for this purpose, they were able to photograph several star clusters, in which stars even of the 12th and 13th magnitude became visible upon the plate. These results led to the construction of a larger instrument of 340 millimetres aperture and 3 to 4 metres focus. This was applied to a large ordinary telescope which served during the time of exposure to keep one and the same point of the heavens continually in the field. The result surpassed all expectation, for stars up to the 16th magnitude were successfully photographed—stars which were so faint that it was impossible to see them by the eye through the same telescope. Here, one might say, in the proper sense of the word, was an astronomy of the invisible, and it must have been with a peculiar joy that the observers saw upon the photographic plate pictures of stars which since the beginning of things had never been revealed to human eye. In order to photograph such faint stars long exposure was necessary, namely one hour and twenty minutes, while stars of the first magnitude gave forth their image in the 200th part of a second. [The limit of this method is the limit of exposure. If a point in the heavens could be kept an unlimited length of time upon a definite point of the photographic plate, any source of light there will reveal itself. Mr. Roberts has adopted, with some success, exposure to the same region on successive nights.]

Variable Stars.

Certain fixed stars exhibit a periodical change in their brightness which in some cases occurs with great regularity, but in the majority of instances more or less irregularly. The first discovery of this variability was made by David Fabricius in the year 1596 in the case of the star *o* in the Whale. This star appeared on the 13th August of that year to be of the 3rd magnitude, whilst in the October following it was no longer visible. That this was a case of variability was first recognised by Holwarda in the year 1636, and the star received, therefore, the

name *Mira*, the wonderful. Since this time numerous variable stars have been discovered, the latest list, drawn up by C. Pickering, embracing somewhere about 200. According to the kind and manner of variability these stars have been divided into five classes.

1. The so-called new stars (*Novæ*) which burst out suddenly and vanish away slowly.

2. Stars of great variability within the space of several months. These stars vary by several magnitudes, being often visible in maximum to the naked eye, whilst in minimum they are frequently not within the scope of powerful telescopes.

3. Stars of slight and irregular variability which have no recognisable fixed period.

4. Stars of fairly regular variability whose periods are of a few weeks only.

5. Stars whose variability is confined to a few hours, and which shine during long periods with a constant light. These are called variables of the Algol type, Algol having been the first discovered of the class.

In the lists and upon the star maps the variables are distinguished by the letter R, provided they had not already been indicated by Greek letters before they were found to be variable.

In reference to the causes which bring about this variability there is great obscurity.* In the case of any star of the Algol type one is led to think of the periodical passage of a dark planet between the star and us, in other words to regard it as a partial eclipse of the star [An orbital notion of Algol has been determined (Vogel, Astron. Nach. No. 2947, and report of Astronomer Royal, Greenwich, May, 1890), and Professor Vogel has given provisional data for the system made up by it and its dark companion.] Where the periods of variability are long and irregular the causes are very obscure. As to the new stars (*Novæ*), the sudden outbursts and slow fading away of any one of these seem to indicate some kind of great catastrophe, probably a collision with another cosmical mass.

Distances of the Fixed Stars.

The distances of the fixed stars from our earth are without exception so considerable that up to the present it has been possible only in a few instances to obtain a substantial value for their parallax. From this it appears that even the nearest fixed star is still four billions of miles away, and one must conclude, on the ground of analogy, that the faintest stars which can be seen by the improved telescopes of to-day are many hundreds, or even thousands of billions of miles distant.†

Double Stars.

If one survey the heaven with a telescope one meets frequently twin stars which lie so near to each other that they can be separated only by a glass of a very high power. These are called

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* In the Bakerian Lecture delivered at the Royal Society, April 12th, 1888, by J. Norman Lockyer, F.R.S., and afterwards published in *Nature*, a new theory is advanced to account for variability. Mr. Lockyer considers that "new stars" are produced by the collision of meteor swarms, and that the more or less regular variables are owing to the periastron passage of one swarm through another (see *Nature*, May 24, 1888, p. 79). In this Lecture Mr. Lockyer endeavours to show that the heavenly bodies are all formed from meteoric dust, and that the differences between them are simply owing to the different degrees of condensation of the dust, and the consequently greater or fewer number of collisions of the particles; the slight condensation and comparatively few collisions giving rise to the weak light of the fainter nebulæ, while the closely condensed swarms show, through all their stages, bright nebulæ, nebular stars, and real suns.—Editor.

† In the Thirteenth Annual Report of the Savilian Professor of Astronomy, read June 6th, 1888, Dr. Pritchard gives a very interesting account of his later operations for stellar parallax, by photographing small portions of the heavens. He is satisfied, not only with the convenience of this method, but also with its unimpeachable accuracy. The following are the results obtained so far:—

61^1 Cygni . . .	$0''{\cdot}4289 \pm 0''{\cdot}0180$	α Cassiopeiæ . .	$0''{\cdot}072 \pm 0''{\cdot}042$*
61^2 Cygni . . .	$0''{\cdot}4353 \pm 0''{\cdot}0152$	β Cassiopeiæ . .	$0''{\cdot}187 \pm 0''{\cdot}039$*
μ Cassiopeiæ . .	$0''{\cdot}0356 \pm 0''{\cdot}0250$	γ Cassiopeiæ . .	$< 0''{\cdot}05 \pm 0''{\cdot}047$*
Polaris	$0''{\cdot}052 \pm 0''{\cdot}0314$		

Later reports of Professor Pritchard give us the parallax of β Andromedæ as 0·092. α Arietis as 0·08. α Persei, 0·074. ϵ Cygni, 0·115. a Cephei, 0·061, but see the Seventeenth Annual Report of the Savilian Professor of Astronomy (Prof. Pritchard) for a complete history up to date (1892) of all effective researches in stellar parallax. [Edit.]

Double Stars. The brightest of the pair is called the "primary," the other its "companion." Frequently, however, both stars are equally bright. The place of the companion in relation to the primary is expressed by distance and angular position.

By distance is meant merely the apparent space which separates the companion from its primary. The appearance of nearness is often owing to the two stars being in almost the same line in regard to the spectator, while their real distance from each other may be immensely great. There are, however, numerous instances in which there is a real propinquity. In these cases the position angle varies in such a manner as to indicate a motion of revolution round a common centre.* Recent observations, especially those made since the time of W. Herschel and F. W. Struve, have proved that many double or multiple stars possess a physical connection with each other.

The position angle is the angle which a line drawn from the companion to its primary forms with the latter's circle of Declination. The position angle is calculated from north through east to south and west.

The number of Double Stars is considerable, about 7,000 being known at the present time. There are also triple, quadruple and quintuple stars, but their number is not large.

The primary and companion are not infrequently of different colours; white and blue, yellow and blue, and green and blue stars being found together. Except in a few cases, however, these colours are only faintly visible, and it requires a certain amount of practice and a powerful telescope to be able to distinguish them.

Star Clusters.

Groups of stars collected more or less closely together in a small space are called star-clusters. Some few star-clusters can be distinguished, though imperfectly, with the naked eye, as, for instance, the Pleiades in Taurus and a cluster in Cancer, but generally they can be clearly seen through the telescope only. Indeed many of them appear misty and nebulous even in telescopes of ordinary size, a powerful instrument being required to resolve them. Most star-clusters seem to be globular in shape, with a strong condensation towards the centre. Frequently the stars in the centre of a cluster are crowded so closely together that they seem a nebulous mass, around which the external stars are collected.

The relative positions of the various stars in these star-clusters have been decided by exact measurement in a few cases only; but the recent strides that have been made in the application of photography to astronomical observations lead us to hope that we shall ere long be able to obtain records of their most minute details. We shall thus by the comparison of photographs taken at intervals of sufficient time, arrive at valuable information with regard to the relative motions of the component stars of these clusters.

Nebulæ.

Nebulæ are among the most remarkable objects to be found in space, but the majority of them cannot be studied in detail except by the aid of the most powerful telescopes. At the present day upwards of 6,000 Nebulæ are known to astronomers. John Herschel prepared a general catalogue containing 5,079 Nebulæ and Star-clusters.

For the sake of brevity the Nebulæ are usually distinguished by the numbers assigned to them in Herschel's catalogue, and this course has been followed in the present work, where the numbers are accompanied by the letters G. C. (General Catalogue).

* See Editorial Note, p. 71.

Whilst most Nebulæ cannot be clearly observed except with a powerful telescope, there are several hundreds, however, which may be studied on a clear night with an ordinary glass, if the weakest power be employed. Viewed in detail, it will be seen that their shapes are various; some round or elliptical, some spindle-shaped, some like planetary disks (*Planetary Nebulæ*), others ring shaped (*Annular Nebulæ*), others spiral (*Spiral Nebulæ*), while many are quite irregular in outline.

The Spectroscope shows that the Nebulæ are masses of incandescent gas* in which hydrogen and nitrogen play an important part. Possibly in these glowing masses we have before us the germs of future worlds, or it may be in some cases the disintegrated remains of former solar systems.

Explanation of the Maps.

The general maps in this atlas include that portion of the heavens which is visible in central Europe, and they cover as far as 33° South Declination. The stars are divided by a system of conventional signs into six classes of magnitude according to their apparent brilliancy. The system of numbering adopted is, as a general rule, that of Bayer, by means of the small letters of the Greek and Latin alphabets. Such variable stars as are not given by Bayer, are marked, as is usual, by the capital letters of the Latin alphabet, beginning with **R**, the word **var** being added. A number of especially interesting variable stars, which at their maximum do not attain to the sixth magnitude, are also given. These stars are distinguished by a small circle. Stars catalogued by Struve as Double Stars, if they have not been noted by Bayer, bear the number they possess in Struve's catalogue with the letter Σ prefixed; all other numbers attached to stars are those of Flamsteed's catalogue.

Star clusters and Nebulæ are distinguished by small circular groups of dots, and the accompanying number is that assigned to each in Herschel's General Catalogue. Lastly, the boundary lines of the various constellations are taken from Argelander.

Description

Of the more interesting Fixed Stars, Star Clusters, and Nebulæ contained in the Maps of this Atlas.

The following list, in which the various stars, etc., are arranged in order of Right Ascension, gives a fairly complete account of what is scientifically known at the present time of each object upon the Maps.† To find in this list any star or nebula contained in the Maps, it is only necessary to take the approximate Right Ascension of the object from the Map and also its number or letter. These will indicate, without trouble, the object in the descriptive Catalogue. The Right Ascension and Declination here given are those for the year 1880, North Declination is shown by the sign +, South Declination by the sign —

The Nautical Almanack furnishes the annual variation in Right Ascension of the principal stars, and from this the Right Ascension for any year can be readily calculated.

* But see Note p. 8.—[Edit.] † The Editor has endeavoured to bring this up to 1892.

Right Ascension 1880.	Declination 1880.	
$0^h\ 3^m$	$+\ 58°\ 29'$	β **Cassiopeiæ.** This star, 2.5 mag., has at 5′ distance a faint companion of 11 mag. Burnham, who observed this star with the 18-inch refractor at Chicago, states that he saw more than a dozen very faint stars nearer to the primary than this companion. (*See note p.* 8.)
$0^h\ 7^m$	$+\ 14°\ 31'$	γ **Pegasi.** 2.5 mag., with two faint companions, 11 and 11.5 mag. respectively. The primary is red in colour, and probably to a slight extent variable.
$0^h\ 9^m$	$+\ 8°\ 9'$	35, **Piscium.** A double star, primary 6 mag., companion 7.8. mag., at 11.5″ distance. Position angle, 150°. No change in the position of the companion has been observed.
$0^h\ 17^m$	$+\ 55°\ 8'$	*T* **Cassiopeiæ.** A red-coloured star, found to be variable by Krüger in 1870. It varies from about 6.5 mag. at maximum, to 11 at minimum. The period of variation is about 436 days.
$0^h\ 18^m$	$+\ 37°\ 55'$	*R* **Andromedæ.** A variable star with a period of about 405 days, noted as such by Argelander in 1858. According to Schoenfeld it is of a rich orange colour. Its magnitude at maximum is 5.5, and at minimum it is invisible, even with a most powerful telescope. [Spectrum, bright lines but variable: *F* probably identified. *Greenwich Observatory*, 1889.]
$0^h\ 18^m$	$-\ 10°\ 0'$	*S* **Ceti.** This star was found to be variable by Borelly in 1872. It varies from 7 mag. to 11 mag. Its supposed period of 324 days is very uncertain.
$0^h\ 19^m$	$+\ 63°\ 24'$	**Place of the New Star in Cassiopeia,** which Tycho observed from 11 Nov., 1572, till March, 1574, as a star of 1 mag. D'Arrest has made a list of all the stars in the neighbourhood of Nova, with the aid of the large refractor at Copenhagen, and states that any star not yet set down in his Chart, which may appear within a radius of 10′ from the place of Nova, may be considered as either new or variable. D'Arrest's Chart will be found at Sheet xvi. of this Atlas. The most brilliant star in this Chart is 8.9 mag., the faintest 16 mag.
$0^h\ 23^m$	$+\ 59°\ 16'$	63, **Star Cluster in Cassiopeia.** The stars composing this cluster, which was discovered by W. Herschel 16 Dec.,1788, are coarsely scattered. The cluster is nearly round in shape, and is from 15′ to 20′ in diameter. Near the centre may be seen a star of 8.5 mag., and one or two others of 9 mag.; the rest are fainter, some of them being scarcely visible.
$0^h\ 25^m$	$+\ 60°\ 51'$	68, **Star Cluster in Cassiopeia,** is about 1′ in diameter, and rich in very minute stars. Discovered by Herschel 26 Nov., 1788, and described by him as but little removed from a resolvable nebula. The stars are densely massed together towards the centre of this cluster, which is globular in shape.
$0^h\ 26^m$	$+\ 6°\ 18'$	51, **Piscium,** 5 mag., has a companion of 9 mag. at 27″ distance. No change has been observed in the position of this latter since the first accurate measurement.

Right Ascension 1880.	Declination 1880.	
$0^h\ 34^m$	$+\ 20°\ 47'$	55, **Piscium**, a double star. The primary is 5 mag., and yellow in colour. The companion at 6.3′ distance is 8 mag. and of a deep blue colour. Two very beautiful stars.
$0^h\ 34^m$	$+\ 55°\ 53'$	α **Cassiopeiæ**, a reddish-coloured star, 2.2 mag., found to be slightly variable by Birt and John Herschel in 1831. It has a companion 9 mag. at 60″ distance. (*See note p.* 8.)
$0^h\ 36^m$	$+\ 40°\ 35'$	116, **The Great Nebula in Andromeda.** In fine weather, if there be no moonlight, this nebula can be clearly seen with an opera-glass. It is mentioned as early as the 10th century by the Persian astronomer Sufi. In the West it seems to have been first noticed by Simon Marius, 15 Dec., 1612. On examining it with the naked eye it appeared to him to be merely a small cloud, and on applying the telescope he could discover no evidence that it was of a stellar nature; it seemed nothing more than a patch of whitish light of greater brilliancy at the centre and fainter at the edges. Marius compared it to a light seen from a great distance through some semi-transparent medium. Halley described the nebula as triangular, but Messier contends that it is formed in the shape of two luminous pyramids applied on opposite sides of a common base, the diagonal passing from apex to apex pointing from N.W. to S.E. The distance between the apices is two-thirds of a degree, and the length of the common base one quarter of a degree. Messier saw no star in the nebula, but noticed an increase of brilliancy towards the centre. Later on F. W. Herschel examined the nebula through his great telescope. The luminous central portion he, too, found to be of a nebulous character, but with indications of its being resolvable into separate stars. The middle, or the so-called nucleus of the nebula, has not a starry appearance, but viewed through a very powerful telescope it has a certain flaky look which confirms Herschel's opinion of its stellar character. Finally, an examination made in 1848, with the aid of the great Refractor at Cambridge, (U.S.A.), proved the existence of upwards of 1,500 minute stars within the nebula, while the nebulous character of the whole was still apparent. Two thin, dark parallel streaks, somewhat like two cracks, were found to run through the mass of stars, and have since been noticed by other observers. In the spectroscope this nebula gives clearly a continuous spectrum, thus proving that it is not a mass of incandescent gas, but rather a highly condensed star-cluster, at least in the central parts. With a powerful glass several faint stars may be seen scattered up and down over the nebula, one of them being of 10.5 mag. About the end of August, 1885, a star of 6.5 mag. suddenly appeared near the centre of the nebula which gave a continuous spectrum containing, probably, a few bright lines. By the middle of the following September it had dwindled down to 8.5 mag., and in the summer of 1886 had disappeared entirely, even the great Refractor at Washington failing to discover it. This new star was not, probably, a condensation of the central portion of the nebula, but seems on the contrary to have had no relation to it. Probably it has always been in the place where it appeared, and is one of the countless faint stars observed there by Bond. The sudden increase in brilliancy which

Right Ascension 1880.	Declination 1880.	
		took place towards the end of August, 1885, was probably not owing to a great eruption of incandescent gas, but rather to other circumstances. Of the various possible theories, that which attributes the phenomenon to the conversion of cosmic motion into heat and light seems the most probable. [Roberts' photograph, taken in December, 1888 (four hours' exposure), gives clearer details than any previously attained. The numerous stellar points in the nebula seem physically connected with it, lying "along the edges of the dark rifts, following all their sinuosities." Ranyard. *Knowledge*, 1889. From a series of photographs taken by Roberts between 1885 and 1890 it is inferred that the nucleus of the nebula is variable.]
0^h 36^m	+ 40° 13′	117, **Companion of the great Nebula in Andromeda.** Viewed through a telescope of low power this has the appearance of a nebulous star. In reality it is a star-cluster, but a very powerful instrument is required to distinguish the separate stars.
0^h 37^m	+ 61° 8′	120, **Star Cluster in Cassiopeia,** discovered by Caroline Herschel. The stars are scattered somewhat coarsely over a space of from 15′ to 20′ in diameter, and range from 9 to 10 mag.
0^h 42^m	— 25° 57′	138, **Nebula in Cetus** was discovered by Caroline Herschel, Sept. 23, 1783; it is long, narrow and bright, and is preceded by a star of 9 magnitude.
0^h 42^m	+ 57° 11′	η **Cassiopeiae,** a yellowish star, 4 mag., with a purple coloured companion of 7.5 mag., discovered by Herschel, 17 Aug., 1779. The distance of the companion in 1882 was 5.2″; the position angle 165.7°; the time of revolution round its primary as calculated by Dunér is 176 years: the parallax, according to Clausen, is 0.371″, indicating a distance from the earth of eleven billion miles.
0^h 43^m	+ 27° 4′	65, **Piscium,** a double star, discovered by Herschel in 1783. Both stars are of 6 mag., and their relative position does not seem to vary. Distance 4.3″.
0^h 48^m	+ 18° 32′	66, **Piscium.** Recognised as a double star at Pulkowa, the primary being 6 mag., the companion 7 mag. Mädler, in 1843, found the distance to be 0.6″. Dembowski, in 1885, could only perceive a single star of elongated form. Burnham, in 1880, calculated the companion's distance to be 0.4″. The velocity of revolution of the companion is very high.
0^h 49^m	+ 60° 4′	γ **Cassiopeiae.** This star, 3 mag., has a companion of 9.5 mag., at distance 432″, position angle 327°. There are nearly a dozen very minute stars nearer to the primary, but they can only be seen with a telescope of the highest power. (*See note p.* 8.)
0^h 50^m	+ 37° 51′	μ **Andromedae,** a double star of 4 mag. and 11 mag., first recognised as such by John Herschel. The distance of the companion is 49″; its position angle 110.5″; only visible with a very powerful telescope.
0^h 52^m	+ 81° 14′	*U* **Cephei,** a variable star of the Algol type, discovered by Ceraski in 1880. The star is generally 7 mag., but diminishes to 9.5 mag. in periods of 2.5 days. With a powerful telescope, two faint companions, of 11.5 and 13 mag. respectively, may be seen.
0^h 58^m	+ 0° 44′	26, **Ceti,** a double star. Primary 6 mag., companion 9 mag.; distance 16″; position angle 253°. The position of the companion does not seem to vary.
0^h 59^m	+ 20° 50′	ψ^1 **Piscium,** a double star, consisting of two white coloured stars of 5 mag.; distance 30″. They can be easily "divided" with the help of a pocket telescope. No change has been observed in their relative positions during the last 130 years.

Right Ascension 1880.	Declination 1880.	
1h 0m	+ 4° 16′	77, **Piscium**, a beautiful double star; primary 6 mag., companion 6.8 mag.; distance 32.8″. No change has been observed in their position.
1h 5m	+ 30° 47′	*g* **Piscium**, recognised as a double star at Pulkowa. Primary 5 mag., companion 10 mag.; distance 2.5″.
1h 7m	+ 23° 57′	φ **Piscium**, 6 mag., with a remarkably faint companion at 7.6″ distance; position angle 22°. Piazzi calls it a double star, but it is quite evident that his telescope would not have enabled him to see it had it been as faint then as it is at the present day.
1h 8m	+ 6° 56′	ζ **Piscium**, a beautiful double star, easy to observe, the primary and companion being 5 mag. and 6 mag. respectively. The distance and position angle have not undergone any essential alteration since Struve measured them in 1821, the former being 24″, the latter 64°. [Shown 1889, to be a triple star.]
1h 11m	+ 71° 59′	*S* **Cassiopeiæ**, a variable star of long period, discovered by Argelander in 1861. At maximum it is 6.7 mag., though it is often less than 8 mag.; at minimum it is under 13 mag., or it becomes quite invisible. The period is 607.5 days. [Bright lines spectrum.]
1h 12m	+ 58° 9′	256, **Star Cluster in Cassiopeiæ**, a large cluster, rich in stars and nearly round in shape. The stars range from 7 to 10 mag. Discovered by Herschel, 18 Sept., 1787. There is a double star in the cluster of 8 and 9 mag.
1h 14m	— 1° 8′	42, **Ceti**, a double star, 6 and 7 mag. Distance only 1.3″.
1h 15m	+ 88° 40′	α **Ursæ Minoris, the Pole Star.** 2 mag.; gives a yellowish light. It has a companion of 9 mag., distance 18.5″, which was discovered by Herschel, 17 Aug., 1779. According to Peters' calculation, its parallax is 0.08″, indicating a distance from the earth of 40 billions of miles, but this result is very untrustworthy. (*See note p.* 8.)
1h 17m	+ 67° 30′	↓ **Cassiopeiæ**, a triple star. Herschel saw only the primary 4.4 mag. and a companion 8.5 mag., at distance 30″. Struve, in 1831, was the first to divide this latter into two separate stars of 8.9 and 9.5 mag. respectively, distance 3″.
1h 19m	+ 8° 55′	307, **Nebula in Pisces**, a bright and fairly large nebula, with an increase of brilliancy towards the centre; 4 stars near to it.
1h 24m	+ 2° 16′	*R* **Piscium**, a variable star of yellowish colour with a long period, discovered by Hind in 1851. At maximum it is from 7½ to 8½ mag., at minimum it is as low as 12½ mag.; it gains more quickly in brilliancy than it loses, and the period is 345 days.
1h 25m	+ 60° 2′	341, **Star Cluster in Cassiopeia.** This is not a very large cluster, but it contains several stars of 6 to 9 mag., among others a red-coloured star of 8 mag., and a double star, primary 6 mag., companion 10 mag., distance 13.6″.
1h 25m	— 7° 29′	342, **Nebula in Cetus**, faint and rather small, much brighter towards the centre. Discovered by Herschel, 10 Sept., 1785.
1h 27m	+ 30° 4′	352, **Nebula in Triangulum.** Discovered first by Messier; very large and faint, but easy to observe in consequence of its extent. With a seven-foot telescope Herschel saw it dimly, and best with a low power. With a ten-foot reflector, the most brilliant part was resolved into separate stars, and when a still stronger instrument was employed, almost the whole nebula was resolved into stars, which seemed to Herschel nothing more than

Right Ascension 1880.	Declination 1880.	
		the smallest imaginable points. This nebula is nearly 30′ in extent. Lord Rosse observed in it nodes of light, and the well-known spiral arrangement shown by his telescope in several similar objects.
1h 29m	— 30° 1′	361, **Nebula in Cetus.** Discovered by Herschel 9 Dec., 1798. This nebula is fairly brilliant, with a brighter nucleus, and is 6′ long by 1½′ broad.
1h 30m	+ 15° 10′	372, **Nebula in Pisces.** Discovered by Méchain in Sept. 1780, and described by him as a starless nebula of fairly large dimensions, but very dull and difficult to observe. Messier confirmed this view. Sir John Herschel, on the other hand, describes it as a globular star cluster, capable of being clearly resolved into separate stars, whose brilliancy increases gradually at first, and then suddenly at the centre. Lord Rosse, with the help of his great telescope, detected a spiral arrangement of the stars. Vogel saw it in October, 1867, with the 8-inch refractor at Leipsic, as a faint, globular star cluster, 3′ in diameter, the stars being a little more densely collected towards the centre.
1h 35m	+ 50° 59′	385, **Nebula in Perseus**, the preceding of two nebulæ, which stand at a distance of 2′ from one another. Méchain saw it first, 5 Sept., 1780, and described it as a small, faint, starless nebula. Messier believed it to consist of small stars, intermingled with nebula; this, however, was a mistake. The nebula is fairly brilliant.
1h 38m	+ 60° 38′	392, **Star Cluster in Cassiopeia**, a beautiful object, 15′ in diameter, rich in stars, ranging from brilliant to faint minute points; a double star, primary 9 mag., companion 10 mag., distance 8″, is to be seen in the cluster; also a red coloured star 8 mag. in the southern portion.
1h 44m	— 11° 17′	χ **Ceti**, 5 mag., at distance 3′ stands a star of 7 mag.
1h 46m	+ 35° 34′	422, **Nebula in Perseus.** In this Herschel, 4 Sept., 1784, discovered four separate starry nebulæ, three standing in a line, the fourth at right angles to them; that at the angle is much the largest. D'Arvest observed these nebulæ a second time. According to Lord Rosse, there are three others near them, but Dreyer thinks these to be identical with those observed by Herschel.
1h 47m	+ 18° 42′	γ **Arietis**, a beautiful double star, primary 4.2 mag., companion 4.4 mag., observed by Hooke in 1644, and described by him as remarkable in the highest degree. It can be divided by the help of a small telescope: distance 8″, position angle 179°. There is besides, at distance 4′, position angle 84°, a faint star, first seen by J. Herschel and South in 1823. Burnham discovered that this star is also double, but its division is extremely difficult. Between it and γ he saw another very faint star.
1h 50m	+ 37° 5′	457, **Star Cluster in Andromeda**, 30′ in diameter, containing numerous brilliant, coarsely scattered stars, visible to a keen eye without the aid of a telescope as a nebulous star. Herschel first observed it 21 Sept., 1786.
1h 51m	+ 23° 1′	λ **Arietis**, a double star, primary 5 mag., companion 8 mag., distance 38″, can be divided by a good pocket telescope.
1h 53m	+ 20° 28′	Σ 196, **Arietis**, a quadruple star, primary 6 mag., companions 9, 10 and 12 mag. respectively. The brightest companion is at distance 3′ 4″, position angle 0.8°.
1h 56m	+ 2° 11′	α **Piscium**, a beautiful double star, primary (which is green in colour) 2.8 mag., companion (which is blue in colour) 3.9 mag., distance 3″. The movement of the companion is very slow.

Right Ascension 1880.	Declination 1880.	
$1^h\ 56^m$	$+\ 32°\ 42'$	ε **Trianguli.** This star, 5.5 mag., has an exceedingly faint companion, distance 4″, position angle 116.8°. It requires a very powerful instrument to distinguish this companion.
$1^h\ 57^m$	$+\ 41°\ 45'$	γ **Adromedae,** a gold-coloured star, 3 mag., with a blue companion, 6 mag. Distance 10″. The colour of both stars is very intense, and they are easily recognised as a double star. In 1842, however, Struve discovered that the companion is itself a double star, consisting of two separate stars of 6.7 mag. and 8.5 mag. respectively, distance only 0.5″. At present this distance is still less (0.3″), and a refractor of great power is required to divide the companion.
$2^h\ 3^m$	$+\ 25°\ 22'$	14, **Arietis,** a triple star ; the primary 5.6 mag., has at distance 93″, position angle 36.4°, a companion 8.9 mag., and a second at distance 106″, position angle, 278.5°. Herschel had measured the distance of the nearer companion in 1783.
$2^h\ 5^m$	$+\ 29°\ 44'$	6, **Trianguli,** a double star, primary (which is yellow) 5 mag., companion (which is blue) 6 mag., distance 3.8″. Discovered by Herschel in 1781.
$2^h\ 9^m$	$+\ 24°\ 30'$	*R* **Arietis,** a variable orange-coloured star, discovered at Bonn in 1857, and since then frequently observed. The period is 186.2 days. At maximum the star is 7.6 to 8.5 mag. ; at minimum 12 mag. and under. When approaching its maximum the increase in brilliancy is often for weeks together very slow.
$2^h\ 11^m$	$+\ 56°\ 36'$	512, 521, **Two large Star Clusters in Perseus,** being one of the most magnificent objects of its kind in the heavens. The larger of the two χ is 30′ in diameter, and consists of a large number of stars ranging in magnitude from 6.5 to 13 and 14. Vogel and Lamont have measured this cluster with the micrometer. The southern cluster *h* is smaller, being 15′ in diameter and less rich. The stars appear condensed towards the centre. Photographs have been taken of both clusters by the brothers Henry, at Paris, and Dr. Lohse at Potsdam.
$2^h\ 13^m$	$-\ 3°\ 31'$	*o* **Ceti (Mira),** a variable star with long period, and the first whose variability was detected. D. Fabricius observed it early on the morning of 12 August, 1596, as somewhat brighter than α Arietis. In October it had disappeared. He saw it again in February and March, 1609; then Holwarda observed it in 1638, and recognised its periodical variability. According to Argelander's calculations the period is 331½ days, but it is very irregular, and the difference of period is sometimes as much as 25 days. Its magnitude at maximum also varies greatly, being sometimes as much as 2 and often not more than 5. At minimum it is 9 mag., being the same magnitude as that of a companion at distance 2′, position angle 85°. The star is of a deep red colour, and gives an interesting spectrum. [The third line of hydrogen has been detected at Greenwich in the spectrum.]
$2^h\ 15^m$	$+\ 41°\ 47'$	527, **Nebula in Andromeda,** fairly brilliant, 15′ long by 3′ broad, with a dark cleft in the middle. Discovered by Miss Herschel in August, 1783. According to John Herschel it is a vast, flat, nebular ring, which is seen obliquely by us.

Right Ascension 1880.	Declination 1880.	
$2^h\ 19^m$	$+66°\ 52'$	ι **Cassiopeiæ** (Σ 262). A triple star, discovered by W. Herschel. The primary 4.2 mag. has one companion 7.1 mag., distance 1.5″, and a second companion 8.1 mag., distance 8.9″. The nearer companion is not easily distinguished.
$2^h\ 20^m$	$-\ 0°\ 43'$	*R* **Ceti,** a variable star, first recognised as such by Argelander, 1866. At maximum it reaches sometimes 7 mag., at minimum, 13 mag. Period, 167 days.
$2^h\ 21^m$	$-\ 1°\ 41'$	544, **Planetary Nebula in Cetus,** rather faint, with a diameter of from 3′ to 4′; there are several stars round it. Discovered by W. Herschel 6 Jan., 1785.
$2^h\ 30^m$	$+\ 5°\ 3'$	ν **Ceti** (Σ 281). A double star, 4.5 mag., with a faint companion of 9.5 mag. Distance 7.7″; position angle, 83°.
$2^h\ 30^m$	$+\ 24°\ 8'$	30, **Arietis.** A beautiful double star, not difficult to observe. Its primary is 6 mag.; companion, 6.5 mag.; distance, 38.6″. Both stars are white in colour. No change in position has been noticed since the time of Bradley.
$2^h\ 33^m$	$+\ 38°\ 33'$	575, **Nebula in Andromeda.** Faint, 10′ in length, spindle-shaped, and surrounded by several faint stars.
$2^h\ 34^m$	$+\ 26°\ 33'$	33, **Arietis** (Σ 289). A double star, first seen by Herschel 27 Sept., 1779. Primary, 5.8 mag.; companion, 8.7 mag.; distance, 28.5″; position angle, 359.4°. No change in position has been observed.
$2^h\ 35^m$	$+\ 42°\ 17'$	584, **Star Cluster in Perseus,** having a diameter of 15′; discovered by Messier. The stars range from 9 to 11 mag., and are coarsely distributed; with a small telescope upwards of 100 stars can be distinguished.
$2^h\ 37^m$	$-\ 0°\ 31'$	600, **Nebula in Cetus,** first discovered by Méchain in 1780. It is small, fairly brilliant, and is preceded by one star, and followed by two others. According to Lord Rosse the nebula shows spiral arrangement.
$2^h\ 37^m$	$+\ 2°\ 44'$	γ **Ceti** (Σ 299). A star of yellow colour, 3.5 mag., with a companion 6.5 mag.; distance 2.4″; position angle, 286°.
$2^h\ 40^m$	$-\ 8°\ 4'$	604, **Nebula in Cetus.** Faint, oval in shape, with a slight increase in brilliancy towards the centre; apparently a star cluster situated at an immeasurable distance.
$2^h\ 42^m$	$+\ 55°\ 24'$	η **Persei** (Σ 307). 4 mag., with a companion (of blueish colour), 8 mag.; distance, 28″. There are also several very faint stars near it.
$2^h\ 42^m$	$+\ 17°\ 2'$	*T* **Arietis.** A variable star, discovered by Auwers 1870. At maximum, 8 mag.; at minimum, 9.5 to 10 mag. Period, 324 days. Of a reddish colour.
$2^h\ 43^m$	$+\ 16°\ 58'$	π **Arietis** (Σ 311). Triple; magnitudes, 5.5, 8, and 10; recognised as triple by Herschel in 1779. The nearest companion is at a distance 3.3″; position angle, 121°. The faint outer companion at distance 25″; position angle, 110°.
$2^h\ 43^m$	$+\ 26°\ 45'$	41, **Arietis.** The primary is 4 mag. Herschel saw a faint companion in 1779 at a distance of 126″ (position angle, as calculated by Burnham in 1879, 230°), then in 1782 a second at distance 34″, position angle, 203°. Finally, Struve, at Pulkowa, discovered yet another very faint companion (11 mag.) at distance 16″. The distance of this latter, as calculated by Burnham in 1879, was 21″, position angle, 266°.

Right Ascension 1880.	Declination 1880.	
$2^h\ 52^m$	$+ 20°\ 52'$	ε **Arietis** (Σ 333), a double star, primary, 4.5 mag., companion 6 mag., distance 1.5″. As conjectured by Struve, the primary probably varies from 4.5 mag. to 6.5 mag., and the companion also seemed to him variable. Engelmann supports this theory.
$2^h\ 57^m$	$+ 38°\ 23'$	ϱ **Persei.** This orange-coloured star was first recognised as variable in 1854, by J. Schmidt. The period is seemingly quite irregular, and the brightness at maximum varies considerably.
$2^h\ 58^m$	$+ 24°\ 47'$	52, **Arietis** (Σ 346), triple, but cannot be clearly divided except by a very powerful telescope. The primary, 5.5 mag., has one companion at distance 0.7″; the outer companion, which is very faint (11 mag.), is at distance 5″.
$3^h\ 0^m$	$+ 40°\ 30'$	β **Persei (Algol),** one of the most interesting variable stars. The variation was discovered as far back as 1767 or 1769, by Montanari, but Goodricke, in 1782, was the first to recognise its true nature. According to his account, the star remains invariable for $2\frac{1}{2}$ days, and then decreases in $4\frac{1}{2}$ hours to 3.7 mag., and during the next $4\frac{1}{2}$ hours it increases to 2.2 mag. The period is 2 days 20h. 48m. 53.4s. This is not constant, there being a difference of a few seconds in the course of the year.
$3^h\ 7^m$	$- 1°\ 39'$	94, **Ceti,** 5.5 mag., has a very faint companion at distance 5.7″, which it needs an extremely powerful telescope to distinguish.
$3^h\ 7^m$	$+ 46°\ 47'$	658, **Star Cluster in Perseus.** A beautiful cluster 8′ in diameter, very rich in stars of 10 mag. and under. Discovered by W. Herschel, 27 Dec., 1786.
$3^h\ 7^m$	$- 29°\ 28'$	12, **Eridani,** a star of 3.5 mag., with a companion 7.5 mag., distance 2.4″, position angle, 316°.
$3^h\ 7^m$	$+ 65°\ 13'$	52, **Camelopardalis.** A star of 6.5 mag., with a companion 7 mag., at a distance of only 0.5″. A very difficult object.
$3^h\ 9^m$	$+ 40°\ 2'$	Σ 369, **Double Star in Perseus.** The primary, 7 mag., is of a yellowish-white colour; the companion, 8 mag., is blueish-white. The distance, 3.5″, seems to be increasing, but very gradually.
$3^h\ 16^m$	$- 15°\ 49'$	692, **Nebula in Eridanus,** rather faint, large, irregularly round in shape, gradually increasing in brilliancy towards the centre. A star, 7 mag., precedes the nebula.
$3^h\ 19^m$	$+ 59°\ 31'$	Σ 385, **Camelopardalis.** The primary, 5 mag., is yellow in colour, the companion, 9 mag., distance 2.4″, position angle, 161°, is white.
$3^h\ 21^m$	$+ 55°\ 2'$	Σ 390, **Camelopardalis.** Primary 5 mag., greenish-white in colour, with a faint companion 9.5 mag., distance 15″, position angle, 160°.
$3^h\ 21^m$	$- 21°\ 46'$	709, **Nebula in Eridanus,** discovered by W. Herschel; fairly bright, elongated, but small, with a nucleus, followed southwards by a small and very faint nebula.
$3^h\ 22^m$	$+ 35°\ 15'$	*R* **Persei,** a variable star. At maximum it sometimes reaches as much as 8 mag., and at minimum becomes frequently less than 13 mag. Period, 208.5 days. According to Schoenfeld it remains at 12 mag. and under for two months' time

Right Ascension 1880.	Declination 1880.	
$3^h\ 23^m$	$+36°\ 53'$	717, **Star Cluster in Perseus,** large (15′ in diameter), contains about 60 stars coarsely scattered. Discovered by Herschel, 28 Dec., 1799.
$3^h\ 24^m$	$+58°\ 21'$	Σ 396, **Camelopardalis,** a star 6.5 mag., with a faint companion, 8 mag., distance 20.3″.
$3^h\ 27^m$	$+24°\ 4'$	7, **Tauri** (Σ 412), 6 mag., with a companion 10 mag., distance 22″. The star is thus described by W. Herschel, South, and John Herschel. But Struve, with the Dorpat Refractor, divided the primary into two stars of almost equal brilliancy, at a distance of only 0.6″ from one another.
$3^h\ 31^m$	$+\ 0°\ 12'$	Σ 422, **Eridani,** a double star, primary 6.5 mag., companion 8 mag., distance 6.5″. The primary is yellow, the companion blueish.
$3^h\ 34^m$	$+\ 4°\ 45'$	Σ 430, **Tauri.** Triple 6.5, 9 and 9.5 mag. The first companion is at distance 26″, position angle, 55°. The second at distance 38″, position angle, 301°. The primary is yellowish.
$3^h\ 35^m$	$+33°\ 35'$	*o* **Persei** (Σ 431) a star 5 mag., with a faint companion 9.5 mag., distance 20″.
$3^h\ 38^m$	$+23°\ 20'$	768, **Nebula in the Pleiades,** discovered by Tempel, 19 Oct., 1859. An extremely faint nebula, situated near the star Merope. The brothers Henry have discovered, by the aid of photography, another very faint nebula which seems to proceed from the star Maia, but this can only be seen with a most powerful telescope. (Cf. Sheet xiii.)*
$3^h\ 40^m$	$+23°\ 44'$	*η* **in the Pleiades,** quadruple and a very beautiful object even as seen with a small telescope. The primary 3.5 mag. has one companion 6.5 mag. at distance 118″, position angle, 289°, a second 7 mag., distance 116″, position angle, 344°. Lastly there is a small star, 9 mag., at distance 115″ from the companion of 6.5 mag., position angle, 303°; *η* is also known by the name of Alcyone. (See Sheet xiii.)
$3^h\ 40^m$	$+52°\ 18'$	775, **Star Cluster in Perseus,** small, consisting of about 30 stars, ranging in magnitude from 11 to 13, besides one star of 10 mag. The whole is from 2′ to 3′ in diameter.
$3^h\ 42^m$	$+10°\ 46'$	30, **Tauri** (Σ 452), primary 5 mag., companion 9 mag., distance 9″.
$3^h\ 42^m$	$+23°\ 41'$	Σ 453, **(Atlas) in the Pleiades,** a star, 4 mag. In 1827 and 1830 Struve fancied that he could distinguish a companion to this star of 8 mag., distance 0.8″. It was, however, never seen afterwards by Struve or any other observer. Even Burnham always found the star to be single and perfectly round.
$3^h\ 47^m$	$+31°\ 32'$	*ζ* **Persei** (Σ 464). Quintuple. The primary 2.7 mag. has, at distance 13″, a companion 9.5 mag., at distance 90″ another of 10 mag., and a third 10 mag., at distance 122″. There is besides a faint star of 12 mag., distance 33″, position angle, 286°.
$3^h\ 48^m$	$-\ 3°\ 19'$	32, **Eridani** (Σ 470), primary 5 mag., yellowish, with a companion 6 mag., distance 6.7″, of a blueish colour. Discovered by W. Herschel in 1781.

[* The fuller traces of nebulosity which, in 1885, appeared round Maia and Mérope, are now shown on more sensitive plates (Dec. 1887) as well-defined nebulæ of complex structure. Mr. Barnard, of the Lick Observatory, has discovered (Nov. 14, 1890) a new and somewhat round cometary nebula close South and following Mérope.—Ed.]

Right Ascension 1880.	Declination 1880.	
$3^h\ 50^m$	$+39°\ 40'$	ε **Persei** (Σ 471), primary 3.5 mag., companion 8 mag., distance 9″. The companion is probably variable, its colour too, is said to change from blue to red.
$3^h\ 50^m$	$+80°\ 22'$	Σ 460, **Cephei**, a very close double star, primary, 5.5 mag., companion 6 mag., distance only 0.7″.
$3^h\ 54^m$	$+12°\ 9'$	λ **Tauri**, found to be variable by Baxendell in 1848. It belongs to the Algol type. Period 4 days; the changes in brilliancy, however, only occupy 10^h; magnitude at maximum 3.4, at minimum 4.2. It loses more quickly than it gains in brilliancy.
$3^h\ 57^m$	$+60°\ 31'$	801, **Nebula in Camelopardalis.** Rosse saw a star of 14 mag., surrounded by a nebular ring in the centre of this nebula. To observe this nebula in detail a most powerful telescope is required: even when examined by an 8-inch refractor it is very faint.
$3^h\ 57^m$	$+62°\ 2'$	Σ 485, **Camelopardalis.** Two stars of about 6 mag. at 18″ distance. A triple star (Σ 484) consisting of three stars of 9 mag., precedes this double star.
$4^h\ 1^m$	$+49°\ 12'$	809, **Star Cluster in Perseus**, very beautiful and rich in stars, 7′ in diameter, rather crowded and irregularly round in shape. This cluster is surrounded by a ring of faint stars, which cannot be well seen except with a very powerful instrument.
$4^h\ 1^m$	$+14°\ 50'$	Σ 495, **Tauri.** Primary 6.5 mag., companion 9 mag., distance 4″.
$4^h\ 2^m$	$+30°\ 28'$	813, **Nebulous Star in Taurus**, a star of 8 mag., surrounded by a faint nebula 3′ in diameter.
$4^h\ 6^m$	$+48°\ 6'$	μ **Persei.** Discovered to be a double star by W. Herschel, 2 Aug., 1782. The primary is 4 mag. and white in colour, the companion 8.5 mag. is at a distance 92″. At Pulkowa another very faint companion was discovered, distance (according to Burnham) 14″, position angle, 349°.
$4^h\ 6^m$	$+50°\ 54'$	820, **Star Cluster in Perseus**, rich in stars, nearly 15′ in diameter, rather crowded with a number of fairly brilliant stars, apparently arranged in curves; 30′ to the south it is followed by a reddish-coloured star of 9 mag.
$4^h\ 8^m$	$+\ 8°\ 58'$	47, **Tauri.** Primary 5 mag., companion 8 mag., distance only 0.8″. There is, in addition, a second very faint companion (12 mag.) at distance 32.2″, position angle, 223°. This last was discovered by Burnham.
$4^h\ 9^m$	$+15°\ 6'$	4, **Tauri.** Up to 1872, J. Schmidt found that he could always make this star out with the naked eye as of 6 mag. In September, 1872, it decreased to 7 mag., and then again became visible to the naked eye, nor has any variation been observed in its brilliancy since 1874.
$4^h\ 9^m$	$-10°\ 33'$	A **Eridani** (Σ 516), primary 5 mag., and yellowish in colour, with a very faint companion 9 mag., distance 6.3″. First discovered to be a double star by W. Herschel, 31 Jan., 1785.
$4^h\ 9^m$	$-13°\ 2'$	826, **Nebula in Eridanus**, a planitary disk, of fair brilliancy. According to Lassell there is a star of 12 mag. in the centre. Herschel, who discovered it in 1785, took it to be a star cluster, and its spectrum supports this view. The nebula is a very small one.

Right Ascension 1880.	Declination 1880.	
$4^h\ 10^m$	— 7° 50′	o^2 **Eridani** (Σ 518). A star of 4·5 mag., with a companion 9 mag., which is itself a double star. The companion is at distance 82″, and the two stars which compose it are at distance 3.6″ from one another. Discovered by W. Herschel in 1783, with the help of a 6-inch reflector.
$4^h\ 12^m$	+ 49° 56′	831, **Star Cluster in Perseus**, the stars are coarsely scattered, fairly numerous, and many of them are of fair brilliancy. Discovered by W. Herschel, 28 Dec., 1790.
$4^h\ 13^m$	+ 27° 4′	φ **Tauri**, a double star, primary (which is reddish) 5.5 mag., companion 8.5 mag. Distance (in 1873) 54″, position angle, 246°.
$4^h\ 15^m$	+ 25° 21′	χ **Tauri** (Σ 528), a star 6 mag., with companion 8 mag., distance 19.3″.
$4^h\ 15^m$	+ 19° 15′	*T* **Tauri**, a variable star of irregular period, discovered by Hind, 1861. It is preceded 1^m by a very remarkable variable nebula (G.C. 839). This latter had been frequently seen since 1854, but in 1861 d'Arrest could not find any trace of it even with the great refractor at Copenhagen. According to Argelander, the star *T* was of 9.4 mag. in 1852; but since 1869 it has always been less than 11 mag.; its brilliancy has seemingly decreased at the same rate as that of the nebula, a noteworthy fact, since it seems to indicate some sort of relation between the two phenomena.
$4^h\ 17^m$	+ 33° 59′	Σ 533, **Persei**, primary, 6.5 mag., companion 7 mag., distance 19″.
$4^h\ 18^m$	+ 22° 1′	κ **Tauri**, two stars of 5 mag. and 6 mag. respectively, at distance 339″ from one another; between the two there is a minute double star of 11.2 and 11.6 mag., distance 5″.
$4^h\ 21^m$	+ 30° 6′	Σ 548, **Tauri**, a double star of 6 and 8 mag., distance 14″.
$4^h\ 22^m$	+ 9° 54′	*R* **Tauri**. First recognised as a variable star by Hind in 1849. It is of a deep red. At maximum it fluctuates between 7.4 and 9 mag.; at minimum it is less than 13 mag. Period of variability nearly 325½ days.
$4^h\ 22^m$	+ 15° 42′	η^1 **Tauri**, two stars of 4 and 4.3 mag., distance 337″. Can be recognised as a double star with the naked eye. In spite of their great apparent distance, the stars seem to stand in a physical relation to each other.
$4^h\ 23^m$	+ 53° 39′	1, **Camelopardalis** (Σ 550), a star of 6.1 mag., with a companion 6.2 mag., at distance 10·4″.
$4^h\ 23^m$	+ 39° 44′	Σ 552, **Persei**, a double star, 6 mag. and 6.5 mag., distance 8.9″. Both stars are white.
$4^h\ 23^m$	+ 15° 23′	80, **Tauri** (Σ 554), 6.5 mag. A very close double star, the companion 7.5 mag., being, in 1879, only at distance 0.6″, and this is continually decreasing.
$4^h\ 25^m$	+ 42° 48′	*m* **Persei**. Two stars of from 6 mag. to 7 mag., at distance 114″. In Herschel's time these stars seem to have been much fainter.
$4^h\ 29^m$	+ 16° 16′	*α* **Tauri** (**Aldebaran**), a red star 1 mag., with a very interesting spectrum (Vogel, Class IIa). It has a companion 10 mag., at distance 113″ [since discovered to be double]. Burnham discovered a second companion at distance 30.4″, position angle, 109°; but it is so faint as to be visible only in a most powerful telescope.
$4^h\ 29^m$	+ 9° 55′	88, **Tauri**, 5 mag., with companion 8 mag., distance 70″. Discovered by W. Herschel, 24 Sept., 1780.

Right Ascension 1880.	Declination 1880.	
$4^h\ 30^m$	$+\ 53°\ 15'$	2, **Camelopardalis** (Σ 566). 6 mag., yellowish, with a blueish companion, 7.4 mag.; distance (according to Engelmann, 1883), 1.9″; position angle, 291.9°.
$4^h\ 32^m$	$+\ 15°\ 41'$	σ **Tauri.** Two stars of 4.6 and 5.5 mag.; distance, 429″; can be divided by the naked eye.
$4^h\ 35^m$	$+\ 22°\ 44'$	τ **Tauri.** 4.5 mag., with an easily distinguished companion, 7 mag., at distance 63″. Discovered by Chr. Mayer.
$4^h\ 38^m$	$-\ 9°\ 1'$	55, **Eridani** (Σ 590). A star of 6.2 mag., with a companion, 7 mag., distance 9″. The primary is yellowish, the companion white in colour. Found to be double by W. Herschel in 1783.
$4^h\ 41^m$	$+\ 10°\ 43'$	905, **Star Cluster in Orion**, consisting of 18 stars of from 8 to 11 mag. Somewhat scattered. Vogel has measured their relative positions with the micrometer.
$4^h\ 45^m$	$+\ 17°\ 20'$	*V* **Tauri.** A variable star, first recognised as such by Auwers, 1870. The star is reddish. At maximum it reaches 8.3 mag.; at minimum it diminishes to 13 mag. Period, 168.6 days.
$4^h\ 48^m$	$+\ 53°\ 33'$	7, **Camelopardalis** (Σ 610). A star of 5 mag., with a very faint companion (11.3 mag.), at distance 25″. Dembowski, in 1864, discovered that the primary was itself a double star, having a companion of 8 mag. at distance 1.2″.
$4^h\ 50^m$	$-\ 5°\ 22'$	*b* **Eridani,** 6 mag., with companion 8 mag., distance 64″.
$4^h\ 51^m$	$+\ 37°\ 43'$	4, **Aurigae** (Σ 616). A star 5.5 mag., giving a greenish light, with a companion 7 mag., distance 6″. First recognised as a double star by W. Herschel, 30 Oct., 1779.
$4^h\ 52^m$	$+\ 7°\ 57'$	*R* **Orionis.** A variable star, of a deep red colour, discovered by Hind in 1848. At maximum it reaches almost 9 mag., at minimum it is less than 13. Period, 379 days. According to Schoenfeld the increase in brilliancy from 10 mag. upwards occupies 70 days; the decrease from maximum to 10 mag., 105 days.
$4^h\ 52^m$	$+\ 53°\ 41'$	940, **Star Cluster in Camelopardalis,** fairly large and conspicuous. The stars are of various magnitudes, and are closer together towards the centre.
$4^h\ 53^m$	$+\ 43°\ 39'$	ε **Aurigae.** Recognised as variable by Schmidt and Heis. The star is 3 mag., but has been seen at times as a star of 4.5 mag. The variations of brilliancy are, however, very irregular, and are often for a long time imperceptible.
$4^h\ 54^m$	$-\ 14°\ 59'$	*R* **Leporis.** A variable star of a bright red colour, called a "crimson star" by Hind. Schmidt, in 1855, was the first to recognise it as variable. The period is about 438 days, but seems to be very irregular. At maximum the star is 6 to 7, at minimum 8.5 mag. It has a remarkable spectrum.
$4^h\ 54^m$	$+\ 3°\ 26'$	Σ 627, **Orionis,** 6.5 mag., with a companion of nearly 7 mag., at distance 21″. This latter has not undergone any perceptible change since 1831.
$4^h\ 59^m$	$+\ 1°\ 1'$	96 B., **Orionis.** A remarkable red-coloured star, estimated by Lalande and Bessel as of 7 mag, but by Birmingham, in 1871, as of 6 mag. The red tint is also probably slightly variable.
$5^h\ 0^m$	$+\ 37°\ 12'$	996, **Star Cluster in Auriga.** This is really not a cluster, but rather a rich field of stars. Herschel first saw it 17 Jan., 1787. The most brilliant stars contained in it are of 7.5 mag., the faintest 11.5 mag.

Right Ascension 1880.	Declination 1880.	
$5^h\ 1^m$	$-\ 3°\ 31'$	1005, **Nebula in Orion**, fairly brilliant, 3′ in diameter, and gradually fading towards the edges. It forms a triangle with two stars, 10 mag. and 12 mag. respectively. Discovered by Herschel, 2 Jan., 1786.
$5^h\ 1^m$	$+\ 8°\ 21'$	*i* **Orionis.** A star of 6 mag., with a companion 7 mag., at distance 1.1″, position angle, 205°.
$5^h\ 2^m$	$+\ 27°\ 52'$	Σ 645, **Aurigae.** A double star, primary 6.5 mag., companion 8 mag., distance 12″, position angle, 26.8°.
$5^h\ 3^m$	$+\ 79°\ 5'$	Σ 634, **Camelopardalis.** A star of 4.5 mag., with a companion 8 mag. In 1834 the distance was 34.5″, but in 1880 it was only 20″; position angle, 60°.
$5^h\ 3^m$	$+\ 16°\ 32'$	1030, **Star Cluster in Taurus**, 20′ to 25′ in diameter, rich and fairly crowded with stars ranging from 11 mag. to 14 mag. Discovered by Herschel, 19 Feb., 1784.
$5^h\ 5^m$	$+\ 0°\ 53'$	Σ 652, **Orionis.** A double star, primary 6.5 mag., companion 8 mag., distance only 1.7″, position angle (Struve, 1830), 184°.
$5^h\ 7^m$	$+\ 2°\ 43'$	ε **Orionis** (Σ 654). A yellow star, 4.7 mag., with a companion 8.5 mag., of a bluish white; distance 7″. No change has been observed in the position of the companion since Herschel's time.
$5^h\ 7^m$	$-\ 12°\ 1'$	*i* **Leporis** (Σ 655). A greenish star, 5 mag., with a faint companion 10.5 mag; distance 12.8.″ This distance does not seem to vary. The position angle, 337°, also seems to be nearly invariable.
$5^h\ 8^m$	$+\ 53°\ 27'$	*R* **Aurigae.** A variable star, first recognised as such at Bonn Observatory in 1862. At maximum it reaches 6.5 to 7.5 mag., at minimum it is almost 13. Period 465 days. The changes in brilliancy are sometimes very peculiar.
$5^h\ 8^m$	$+\ 45°\ 52'$	α **Aurigae (Capella).** A white star, 1 mag., with companion 9 mag; distance 159″, position angle, 146.2° (discovered by Herschel). Burnham found two other very faint companions, magnitude 12 and 13 mag., distance 78″ and 126″, position angle, 317° and 183° respectively. Struve (in 1838) conjectured that Capella had become more brilliant than formerly, and that it was at one time fainter than Vega. J. Herschel supported this theory.
$5^h\ 8^m$	$+\ 32°\ 33'$	14, **Aurigae** (Σ 652), triple. The primary, 5.5 mag., has a companion 7 mag., at distance 14.5″. This was first seen by W. Herschel, 24 Sept., 1780. Struve, in 1830, discovered another very faint companion (11 mag.) at distance 12.6″, position angle, 342°. [Belongs to III. type.]
$5^h\ 8^m$	$-\ 13°\ 5'$	κ **Leporis** (Σ 661). A double star, primary 5, companion 8 mag., distance 2.5″. According to Struve, the primary is yellowish, the companion bluish.
$5^h\ 9^m$	$+\ 8°\ 20'$	β **Orionis (Rigel)** (Σ 668). A brilliant star, 1 mag., with a companion 8 mag., distance 9.6″. Discovered by W. Herschel, and a very beautiful object in a powerful telescope. The companion, as remarked by Burnham in 1871, is itself a double star, but it is such a difficult object that Burnham himself, with the 18-inch refractor at Chicago, only at times succeeded in "dividing" it. Other observers have so far been unable to do so. There is yet another very faint star at distance 44″, position angle, 1.5°. According to Seidel, β is in a slight degree variable.

Right Ascension 1880.	Declination 1880.	
$5^h\ 10^m$	$+\ 20°\ 0'$	Σ 674, **Tauri,** a star of 6.5 mag., with a companion 9 mag., distance 10.5″, position angle, 147.3°.
$5^h\ 11^m$	$+\ 39°\ 59'$	λ **Aurigae.** 5 mag., with a companion 9 mag., distance 121″. Burnham found yet another very faint star at distance 40″, position angle, 198°.
$5^h\ 12^m$	$+\ 39°\ 13'$	1067, **Star Cluster in Auriga,** a beautiful group of stars slightly denser towards the centre. A star of 7 mag. outshines all the others. Discovered by Herschel, 18 Oct., 1786.
$5^h\ 12^m$	$+\ 46°\ 51'$	Σ 681, **Aurigae,** a double star, primary 6.5 mag., companion 9 mag., distance 23.2″, position angle, 180.8°.
$5^h\ 12^m$	$-\ 6°\ 58'$	τ **Orionis.** This star, 4 mag., has three very faint companions. Burnham gives the following measurements:— A B Distance 36.2″ Position angle, 249.1°. A C „ 36.1″ „ 60.0°. B b „ 4.0″ „ 50.6°. It was Burnham who discovered that B is a double star: B is 10.5 mag., C 11 mag.
$5^h\ 17^m$	$+\ 3°\ 26'$	*m* **Orionis** (Σ 696), a greenish-white star 5.5 mag., with a companion (white) 7 mag., distance 31.7″, position angle, 28.1°. No change of position has, as yet, been observed.
$5^h\ 17^m$	$+\ 17°\ 16'$	111, **Tauri,** a star of 5.5 mag., with a companion 8 mag., distance 75″, position angle, 271°. Herschel had already made the measurements.
$5^h\ 17^m$	$-\ 24°\ 54'$	**Triple star in Lepus.** The primary is 6 mag., the nearer companion, which is at distance 3.5″, is 9 mag., the farther companion, which is at distance 59″, is 8.5 mag.
$5^h\ 17^m$	$+\ 33°\ 17'$	1101, **Star Cluster in Auriga,** fairly large, and rich in stars, slightly denser towards the centre.
$5^h\ 18^m$	$-\ 2°\ 31'$	π **Orionis,** 3.5 mag., with a companion, 5 mag., at distance 110″. Dawes, in 1848, discovered that the primary was itself a double star, having a companion of 5.5 mag. at distance 1″. It requires a very strong instrument to "divide" this star.
$5^h\ 18^m$	$+\ 6°\ 14'$	γ **Orionis,** a star of 2 mag., supposed by J. Herschel to be slightly variable. Gould, too, finds slight variations, but only of about $\frac{1}{3}$ mag.
$5^h\ 19^m$	$-\ 24°\ 38'$	1112, **Star Cluster in Lepus,** a splendid globular cluster discovered by Méchain, and which Messier described as a starless nebula with a brilliant centre. Herschel was the first to resolve the nebula into stars.
$5^h\ 20^m$	$+\ 35°\ 13'$	1114, **Star Cluster in Auriga,** a somewhat crowded circular cluster, 4′ in diameter, consisting of small stars ranging in magnitude from 9 to 12. Discovered by W. Herschel, 17 Jan., 1787.
$5^h\ 21^m$	$+\ 2°\ 59'$	ψ^2 **Orionis,** a star of 5.5 mag., with a very faint companion of 11 mag., distance 2.9″, position angle, 322°.
$5^h\ 21^m$	$+\ 35°\ 47'$	1119, **Star Cluster in Auriga,** a beautiful object, about 10′ in diameter. Discovered by Messier. A brilliant star may be observed in the centre. The stars are of unequal brilliancy. Its form, according to Messier, is quadratic. The cluster is not at all nebulous if examined with a powerful telescope.

Right Ascension 1880.	Declination 1880.	
$5^h\ 22^m$	$+\ 25°\ 3'$	118, **Tauri** (Σ 716), a double star, primary 6 mag., companion 7 mag. Discovered by Herschel in 1782, but since his time the position of the companion has undergone little or no change. Distance 5″, position angle, 200°.
$5^h\ 23^m$	$-\ 20°\ 51'$	*β* **Leporis**. This star, 3 mag., has, as discovered by Burnham, several very faint companions (10—11 mag.), whose position he thus calculated in 1879 :— A B distance 2.7″; position angle, 288°. A C distance 206.3″; position angle, 75°. A D distance 241.5″; position angle, 58°. In 1834, J. Herschel saw a faint star at about 70″ distance, position angle, 146°.
$5^h\ 23^m$	$-\ 1°\ 11'$	31, **Orionis** (Σ 725), a double star, primary 5.8 mag., companion 11 mag., distance 12.7″, position angle, 88.4°. The primary is reddish in colour and apparently variable; at least Gould at Cordova estimated its magnitude at various times as 4.7 mag., to 6 mag.
$5^h\ 24^m$	$+\ 5°\ 51'$	*A* 32, **Orionis** (Σ 728), 5.2 mag., with a companion 6.7 mag., distance (in 1878) only 0.5″. In W. Herschel's time the distance was more than 1″.
$5^h\ 24^m$	$+\ 34°\ 9'$	1137, **Nebula in Auriga**, a large, brilliant, circular nebula, with a slightly increased brilliancy at the centre, where there is a triple star. The whole is 5′ in diameter. Discovered by Herschel 4 Feb., 1793. According to Brodie the nebula is very faint.
$5^h\ 25^m$	$+\ 3°\ 12'$	n′ 33, **Orionis** (Σ 729), 6 mag., with a companion of 7 mag., at distance 1.9″. Not easy to observe with an ordinary telescope.
$5^h\ 25^m$	$+\ 16°\ 59'$	Σ 730, **Tauri**, a double star, 6.5 and 7 mag. Distance 9.8″. Position angle, 142°.
$5^h\ 25^m$	$+\ 30°\ 21'$	[**Nova Aurigæ.** This new star was discovered on January 24th, 1892, by Dr. T. D. Anderson, of Edinburgh. It was found afterwards to have imprinted its image on the photographic plate of Prof. Pickering, U.S.A., on the nights of December 10th and 20th, 1891. When discovered it was a star of the 5th magnitude; by April 26th it had become a star of the 15th magnitude. Its spectrum was seen to be very like the *Nova* of 1866, and it has in many respects a spectrum similar to that of Vega. Vogel has discovered in the spectrum, beside the hydrogen lines, the lines of the Solar Chromosphere, which had been recognised also in the Nova in Cygnus of 1876. Vogel also thinks, from an examination of the spectrum, that we have to do with three celestial bodies, one having a dark line spectrum, and the other two bright lines. The relative rates of movement of these bodies on the line of vision have also been calculated by Vogel. The increased temperature and consequent brilliancy may be owing to the near approach to each other of these bodies.—Ed.]
$5^h\ 26^m$	$-\ 0°\ 23'$	*δ* **Orionis**, a double star, 2.5 and 6.8 mag. Distance 52.7″. Burnham lately noticed yet another companion of between 13 and 14 mag., and remarks that this is one of the faintest that he has ever seen near a brilliant star. The primary is variable, but only to extent of half a magnitude, and the period is irregular.
$5^h\ 27^m$	$+\ 21°\ 56'$	1157, **Nebula in Taurus.** Seen as far back as 1731, by Messier, but imperfectly, and described by him as a starless nebula, something like a dull flame. W. Herschel thought it capable of being resolved, and alluded to it as a magnificent object. Lord Rosse, with his great telescope, was the first to obtain an exact view of the nebula; he compared its appearance to that of a crab (crab-nebula); he saw several very minute stars in it, and gave a drawing of the whole. Dreyer, however, asserts that all the former representations of this nebula fail to give a satisfactory description of its appearance as seen through a telescope of the highest power.
$5^h\ 27^m$	$-\ 17°\ 55'$	*α* **Leporis**, yellowish, 3.5 mag., with a companion 10 mag., at distance 35″, position angle, 156°.
$5^h\ 28^m$	$+\ 34°\ 4'$	1166, **Star Cluster in Auriga.** Near the star *φ*. A cluster 9′ in diameter, a very fine view of which may be obtained with a 3½-inch refractor. The stars are from 7 to 11 mag., the double star Σ 737 (8 and 9 mag., distance 10.6″.) being among them.

Right Ascension 1880.	Declination 1880.	
$5^h\ 29^m$	$+\ 9°\ 51'$	λ **Orionis** (Σ 738), a yellowish-white star, 3.5 mag., with a reddish companion 6 mag., distance 4″. This latter had already been seen by Herschel. Struve found another very faint star (12 mag.), distance 27″, position angle, 184°, and another of 10.5 mag., distance 149″, position angle, 278.
$5^h\ 29^m$	$-\ 6°\ 5'$	Σ 747, **Orionis**, a double star, 5.6 and 6.5 mag., distance 36″. The position of the companion has not changed since 1833.
$5^h\ 29^m$	$-\ 5°\ 28'$	1179, **The great Nebula in Orion**, the most conspicuous and interesting object of its kind in the Northern Heavens, and an inexhaustible field of research to all who have a powerful telescope at their disposal. No description can give an adequate picture of this nebula. The earlier accounts given by De Vico, Herschel, and others are not satisfactory. Only the sketches given by Rosse, Bond, and Tempel can be considered at all adequate. In Sheet xiv. will be found a reproduction of Bond's masterpiece. This map was obtained with the help of a 14-in. refractor, a first-class instrument, though far inferior to Rosse's 6-foot reflecting telescope in point of illuminating power. Nevertheless, this latter failed to discover any additional feature of importance. Bond's drawing covers an area of $3\frac{1}{3}°$ square. Taking the quadruple star, θ Orionis (Σ 748), which forms the celebrated Trapezium, as a starting point, this area extends 2′ 15″ on both sides in Right Ascension, and 1° 30′ in Declination to the north and south respectively. The chief nebula round θ seems to be connected with the nebulæ round *c* and *ι*; at least, the observations of Rosse and Bond point to this conclusion, while Herschel is undecided. G. P. Bond has given a list of 1,101 stars, all of which, however, are in positions where his refractor showed nebular matter connected with the great nebula. Bond has also pointed out a kind of spiral structure in certain portions of the Orion nebula. This shows itself in narrow crooked streaks, of which several frequently proceed from a common centre. Since Herschel's time, many attempts have been made to resolve the nebula in Orion into separate stars; especially has the part south of the Trapezium, which is generally called after the astronomer Huyghens, and of which the most brilliant portion seems to be drawn out into a rhomboidal or lozenge shape, been carefully examined with the most powerful telescopes with a view to disintegration. For a long time it was reported that Lord Rosse's great telescope had succeeded in resolving this portion of the nebula into a star cluster, but this was not the case. Rosse and his collaborateur, Hunter, succeeded only in discovering faint luminous points in individual places where no stars had been seen previously. Finally, spectrum analysis has proved that the nebula is composed principally of masses of luminous gas. The central portion may be said to be marked off by the four brilliant stars which compose the celebrated Trapezium, which, standing on a dark background, are surrounded by masses of luminous nebula. The elder Herschel, who began his astronomical labours by measuring the distances of the stars in the Trapezium, never observed more than four stars there. Struve saw a fifth (12 mag.) in 1826; Sir John Herschel and South in 1832 discovered a sixth of 13 mag.; and De Vico in 1839 saw three others, but these have never since been again

Right Ascension 1880.	Declination 1880.	
		observed even in the most powerful telescopes. Lamont also discovered two stars which could be considered as belonging to the Trapezium, and Lassell, at Malta, 2 Jan., 1862, another very faint star, so that altogether the total number of stars belonging to the Trapezium, which have been observed within a space of 4 minutes square, amounts to 11 or 12. These, however, have never been visible at the same time to one observer. Moreover, Burnham, who is unquestionably one of the ablest, if not the most able, observer in this particular field, absolutely declines to admit that more than six stars are visible in the Trapezium, and considers the observations which oppose this theory to be untrustworthy. He likewise refuses to credit the supposed variability of the fifth or sixth star. This last he thinks to be of 12 mag. [From the splendid photographs taken 1888-89 by Mr. Roberts, it is clear that the mass of the nebula is concave towards an axis "passing through the Trapezium in a north-easterly and south-westerly direction." Ranyard, *Knowledge*, xii. p. 147. These photographs also show an implication of outlying regions in the great spiral sweep of this nebula.]
$5^h\ 30^m$	$-4°\ 27'$	1184, **Star Cluster in Orion.** An extended group of stars, of 6 and 7 mag., besides some fainter ones. Among them is a double star (Σ 750), 6 and 9 mag., distance 4.3″.
$5^h\ 30^m$	$-6°\ 0'$	ι **Orionis** (Σ 752). A triple star, primary 3.5 mag., companions, 7 and 9.5 mag. W. Herschel saw only the companion of 7 mag. at distance 11.3″. The farther and fainter companion (distance 50″), was observed by South in 1824. [This triple is said to be enveloped in a nebula. "System of the Stars," p. 262.]
$5^h\ 30^m$	$-5°\ 21'$	1185, **Nebula in Orion,** fairly brilliant and large, brighter towards the centre, where there is a star of 8 mag. Messeir had observed this object, and described it as a star with a nebulous envelope.
$5^h\ 30^m$	$+21°\ 9'$	1191, **Variable Nebula in Taurus.** A star of 11 mag. was observed in this place by Chacornac in 1852, but without any trace of nebula. Next year he saw the star again, this time surrounded by nebula; on 27 Jan., 1856, the nebula had become very brilliant, but in 1862 it had entirely disappeared, and has not since been observed. The star (11 mag.) has not been observed to vary.
$5^h\ 30^m$	$-1°\ 17'$	1193, **Nebula round ε Orionis.** On Jan. 2, 1786, W. Herschel writes in his diary that he is nearly certain that ε Orionis is surrounded by an irregularly blurred, milky mass of nebula. This observation was, as it turned out, a just one; several other observers have noticed the faint nebula round the star. Rosse's great telescope showed it in 1850 and 1852; but in 1874 and 1878, in spite of many efforts, it was impossible to distinguish it, even with this instrument. ε Orionis has besides a faint companion, of 9 mag., distance 3′, position angle, 57°.
$5^h\ 31^m$	$+25°\ 45'$	1199, **Star Cluster in Taurus.** A large cluster, 15′ in diameter. The stars are all of nearly equal magnitude, and evenly distributed, but not very numerous. Discovered by Herschel, 7 Dec., 1785.
$5^h\ 31^m$	$+30°\ 26'$	26, **Aurigae.** A double star, 6 and 8 mag., distance 12″. Discovered by W. Herschel in 1782. Burnham found also a small star, 11 mag., distance, 26″, position angle, 113°.

Right Ascension 1880.	Declination 1880.	
$5^h\ 33^m$	$-\ 2°\ 40'$	**σ Orionis.** A multiple star, really a group consisting of two quadruple and two very faint stars. The primary (Σ 762) is 4 mag., and has one companion B (7.5 mag.), distance 12″, position angle, 48°; another C (6.5 mag.), distance 61″, position angle, 42°; and finally a third very faint companion (11 mag.), a, distance 12″, position angle, 236°. The second quadruple star is at a distance 3½′, position angle, 322°. The three most brilliant stars of this are 8.5 mag. Between these two groups a very powerful instrument shows two very faint stars. [There seems to be no relative motion among the members of the group.]
$5^h\ 34^m$	$-17°\ 55'$	45, **Leporis, a Multiple Star.** Described by J. Herschel as quintuple, but it has other companions as well, though they are very faint, and were first discovered by Burnham. The latter gives the following magnitudes: A 6.8, B 9.3, C 8, D 8.5, E 8.5, F 13, G 10, a 8.3, b 9.7. When Burnham directed his attention to this system of stars he saw at a glance that A and B were each of them double stars. The following measurements, calculated by Burnham and Dembowski, give the relative positions of the various stars belonging to the system. d=distance, p = position angle.

	d	p		d	p
A B	89.4″	136.0°	A E	60.3″	48.7°
A C	76.2″	6.2°	A F	41.8″	310.4°
A D	126.4″	298.0°	A a	0.9″	137.8°
			B b	1.5″	359.7°
			B a	51.3″	31.8°

J. Herschel saw only the stars A, B, C, D, E.

$5^h\ 35^m$	$+\ 9°\ 2'$	1225, **Nebula in Orion.** Not very brilliant, small, planetary; seen with a low power it resembles a star of large diameter. Herschel saw it 28 Dec. 1785, with a magnifying power of 240, as an ill-defined, planetary nebula. It is preceded by several small stars. Lord Rosse conjectures that it is a star cluster at an immeasurable distance.
$5^h\ 35^m$	$-\ 2°\ 1'$	ζ **Orionis** (Σ 744). A beautiful double star, 2 and 5.7 mag., distance 2.6″, discovered by Kunowsky in 1819. Changes in the position of the companion cannot be affirmed with certainty. A star of 9 mag. stands at distance 57″, position angle, 9.1°.
$5^h\ 36^m$	$-\ 2°\ 18'$	1226, **Nebula in Orion.** A star of fair brilliancy, in the middle of a nebula 5′ long by 4′ broad. Discovered by W. Herschel, 6 Jan., 1785.
$5^h\ 36^m$	$-\ 1°\ 55'$	1227, **Nebula in Orion,** irregular, of fair brilliancy and size, with a dark space in centre. Discovered by W. Herschel, 1 Jan., 1786, who described it as a remarkable, milky, nebulous mass, divided into 3 or 4 large strips, which surround a dark space. He estimated its size at not less than ½°, and thought it was probably much larger. This nebula follows a little to the north of ζ Orionis, and when viewed with a low magnifying power, comes into a field of vision at the same moment. Sheet xviii. shows this nebula as it appeared to Tempel at Florence.

Right Ascension 1880.	Declination 1880.	
$5^h\ 39^m$	$+65°\ 43'$	Σ 780, **Camelopardalis.** A triple star, discovered by Struve. Primary (A) is 7 mag., the nearer companion (B) 8.5 mag., the farther (C) 12 mag. Struve, in 1831, gave the following measurements: A B, d= 3.7″, p=103.5°; A C, d=10.9″, p=154.8°.
$5^h\ 40^m$	$-22°\ 29'$	γ **Leporis.** Primary, 4 mag., somewhat yellowish, at distance 94″, position angle, 349°, is a star of 8 mag.
$5^h\ 41^m$	$-0°\ 2'$	1267, **Nebula in Orion,** seen by Méchain in 1780, and described as consisting of two brilliant stars surrounded by nebula. In it there is a double star, 8 and 8.5 mag., 51″ distance. Burnham found that the companion is itself double; distance 1.7″.
$5^h\ 42^m$	$+6°\ 25'$	52, **Orionis** (Σ 795). A star of 5.5 mag., with a companion 7 mag., distance 1.5″. Discovered by Herschel, 1 Oct. 1781; the companion can be seen with a $3\frac{1}{2}$-inch telescope.
$5^h\ 44^m$	$+32°\ 31'$	1295, **Star Cluster in Auriga,** discovered by Messier, and a splendid object. Seen with a pocket-telescope, it looks like a nebulous star. Messier says that the stars are very crowded, and slightly mingled with nebula. They are of 10 mag. and under. Over 500 may be seen with a powerful telescope. Diameter of the whole, 24′.
$5^h\ 48^m$	$+5°\ 51'$	Σ 816, **Orionis.** A double star, 6.5 and 8.5 mag. Distance 4.2″, position angle, according to Struve (1830), 289°.
$5^h\ 48^m$	$+0°\ 21'$	1310, **Star Cluster in Orion,** 7′ to 8′ in diameter. The stars are, however, small and somewhat crowded.
$5^h\ 49^m$	$+7°\ 23'$	α **Orionis (Betelgeux),** a brilliant red star, 1 mag., which (as discovered by W. Herschel) has a companion of 10 mag. at distance 161″. Burnham saw, besides this, several much fainter stars nearer to α. Betelgeux is variable, as discovered by J. Herschel in 1836, but the period of variability seems to be very irregular. The star has an interesting spectrum which has been carefully studied by Huggins.
$5^h\ 50^m$	$+44°\ 53'$	[β **Aurigae.** It is announced that the spectral lines of this star are doubled every alternate night, indicating a revolution in four days.]
$5^h\ 52^m$	$+37°\ 12'$	θ **Aurigae,** a triple star. Primary 3 mag., nearer companion 7 mag. The farther, 9 mag. The distance of the former is 2″, of the latter 45″. According to O. Struve there is a fourth star 10 mag. at distance 125″, position angle, 350°.
$5^h\ 53^m$	$+23°\ 18'$	1325, **Star Cluster in Gemini,** a cluster of 6′ to 7′ in diameter, containing coarsely-scattered stars of 7 to 11 mag. W. Herschel discovered it 16 November, 1784.
$6^h\ 1^m$	$+24°\ 20'$	1360, **Star Cluster in Gemini,** a very splendid object, seen by Messier, 20′ in diameter. The most brilliant stars in it are of 9 mag. The field of vision is, however, filled with stars ranging from this magnitude to the faintest points of light.
$6\ 2^m$	$+13°\ 59'$	1361, **Star Cluster in Orion,** fairly considerable, consisting of about 30 stars of 9 to 10 mag., among others a double star (Σ 848) of 7 and 8 mag., distance 2.3″. This is a little north of the centre of the cluster.
$6^h\ 2^m$	$+48°\ 44'$	41, **Aurigae** (Σ 845), a double star, 6 and 6.5 mag., discovered by Herschel. The distance (8.0″) and position angle, (353°) do not seem to vary.
$6^h\ 3^m$	$+2°\ 31'$	Σ 855, **Orionis,** 6 mag., with a companion 6.7 mag., distance 29.3″.

Right Ascension 1880.	Declination 1880.	
$6^h\ 3^m$	$-11°\ 8'$	4, **Monocerotis**. A triple star; the nearer companion discovered by Burnham; the farther by Knott. Primary A is 6.5, B 9.5, C 10 mag. Measurements according to Dembowski, 1876: A B distance 3.1″. Position angle, 178°. A C „ 8.9″. „ 244.5°.
$6^h\ 6^m$	$+5°\ 29'$	1376, **Star Cluster in Orion**, 5′ to 6′ in diameter, a rather crowded collection of brilliant and faint stars.
$6^h\ 7^m$	$+12°\ 50'$	1383, **Star Cluster in Pegasus**, a beautiful cluster from 7′ to 8′ in diameter. With a low power, the field of vision seems filled with numerous stars of 10 to 12 mag. In two places the stars are densely crowded, and one of these places looks in a small telescope like a nebula.
$6^h\ 7^m$	$+36°\ 12'$	Σ 872, **Aurigae**. Primary 6.5, companion 7 mag. The distance (11″) and position angle, (217°) do not seem to vary.
$6^h\ 8^m$	$+22°\ 32'$	*η* **Geminorum**. This yellow star, as discovered by Schmidt, in 1865, varies between 3.2 and 4 mag. Period of variability about 229 days.
$6^h\ 9^m$	$-6°\ 14'$	5, **Monocerotis**, a star of 4.5 mag. of a decided orange colour.
$6^h\ 11^m$	$+59°\ 25'$	4, **Lyncis** (Σ 881). This star, 6.5 mag., has a companion 8 mag., but this latter is so near to the primary that it can be divided only by a most powerful telescope. O. Struve (1847) found p=95.6°, d=0.87″.
$6^h\ 16^m$	$+22°\ 34'$	*μ* **Geminorum**. A yellow star 3 mag., with a very faint companion (11 mag. or less) at distance 72″, position angle, 77°.
$6^h\ 16^m$	$+58°\ 29'$	5, **Lyncis** (Σ 894), triple, primary 6, the nearest companion 10.5, the farther 8 mag. Burnham (1879) calculated: A B: p=139.1°, d=30.3″; A C: p=272.5°, d=95.9″.
$6^h\ 18^m$	$+4°\ 39'$	8, **Monocerotis** (Σ 900). A yellowish star 4.5 mag., with a blueish companion 6.7 mag., distance 13.7″. Can be divided with a small telescope.
$6^h\ 19^m$	$+7°\ 9'$	*T* **Monocerotis**. A variable star, whose light fluctuates between 6.2 and 7.6 mag., within a period of 26.8 days. The changes of brilliancy were detected by Gould in 1871. According to Schoenfeld the maximum and minimum of brilliancy fluctuate somewhat at different periods.
$6^h\ 21^m$	$+12°\ 43'$	1408, **Star Cluster in Monoceros**. Consists of 40 or 50 stars of from 10 to 11 mag., rather coarsely scattered upon a nebulous background. This last is difficult to see.
$6^h\ 21^m$	$+20°\ 52'$	15, **Geminorum**, yellowish, 6.5 mag., with a blueish-white companion 7.5 mag., distance 31″.
$6^h\ 22^m$	$-4°\ 41'$	1415, **Star Cluster in Monoceros**, contains a yellowish star 6 mag. (10 Monocerotis).
$6^h\ 23^m$	$-6°\ 57'$	11, **Monocerotis** (Σ 919). Quadruple, A 5.5, B 6, C 6.5, D 12 mag. The three brilliant stars were first seen by Herschel, the faint companion by Burnham. Dunér (1871) calculates: A B Distance 7.2″ Position angle, 132.2° B C „ 2.3″ „ 105.0° Burnham: A D „ 25.8″ „ 56.1°

Right Ascension 1880.	Declination 1880.	
$6^h\ 24^m$	$+\ 11°\ 22'$	Σ 921, **Monocerotis**, a star of 6.5 mag., with a companion of nearly 8 mag. Distance 16″, position angle, 4°.
$6^h\ 26^m$	$+\ 4°\ 57'$	1424, **Star Cluster in Monoceros**, visible on a clear night, with the naked eye as a nebulous star. With a telescope is seen to be a somewhat dense cluster of stars, one of which (12 Monocerotis) is of 6 mag.
$6^h\ 26^m$	$+\ 10°\ 15'$	1452, **Nebula in Monoceros.** A very interesting object, fairly bright, comet-shaped, or rather fan-shaped, extending from a star of 10 to 11 mag. The whole is probably $1\frac{1}{2}'$ long.
$6\ 28^m$	$+\ 7°\ 40'$	14, **Monocerotis** (Σ 938), yellowish-white, 6.5 mag., with a very faint companion (12 mag.) Distance 10″, position angle 209.9°.
$6^h\ 31^m$	$+\ 16°\ 30'$	γ **Geminorium**, a star of 2.5 mag. with 2 faint companions at a considerable distance. Burnham gives the following measurements. A B Distance 141.7″ Position angle, 335.5° A C „ 294.7″ „ 133.0°
$6^h\ 32^m$	$+\ 10°\ 59'$	1435, **Star Cluster in Monoceros,** large, containing about 40 stars of 9.5 to 12 mag., which are irregularly distributed.
$6^h\ 34^m$	$+\ 10°\ 0'$	*S* (15) **Monocerotis** (Σ 950), the chief star of a coarsely scattered star cluster (G.C. 1440) 6 mag., with two companions, one 9 mag., distance 3″, the other 11.5 mag., distance 16″. The primary is surrounded by a thin veil of nebula, and, as discovered by Winnecke, varies about half a magnitude. The duration of light variability is only 3 days, $10^h\ 38^m$. The colour of this star is described by Struve as green, it is now yellowish.
$6^h\ 36^m$	$+\ 59°\ 34'$	12, **Lyncis** (Σ 948), triple, 5.2, 6.1 and 7.4 mag. Discovered by W. Herschel in 1780. The nearest companion is at a distance 1.4″; the further at distance 8.7″.
$6^h\ 37^m$	$+\ 25°\ 15'$	ε **Geminorum.** This white star of 3.5. mag., has a companion of 8.5 mag., at distance 111″, position angle, 94°.
$6^h\ 38^m$	$+\ 43°\ 42'$	56, **Aurigae.** 6 mag., of a clear white colour, with a blueish-white companion 8 mag., at distance 48″, position angle, 21.1°.
$6^h\ 38^m$	$+\ 55°\ 52'$	Σ 958, **Lyncis.** 6 mag., consisting of two white stars of almost equal magnitude, at distance 5″.
$6^h\ 40^m$	$-\ 16°\ 33'$	α **Canis Majoris** (**Sirius**). The most brilliant fixed star in the heavens; viewed with a powerful telescope, it is of dazzling splendour, and may be compared to a sun. [Hydrogen lines are very strong in the spectrum.] The ancients described Sirius as red, at present it is perfectly white; it has probably changed its colour since the days of Ptolemy. [But see "Observatory," No. 120, p. 104.] Bessel (in 1844) was the first to declare that Sirius must have a companion, as its proper motion showed irregularities which could be only explained by this hypothesis. In January, 1862, the companion demanded by Bessel's theory was discovered by the younger Clark with an 18-inch refractor; it was afterwards actually seen with smaller instruments, and Auwers estimated the time of its revolution at 49 years. The companion is 8.5 mag., and in 1860-70 was at distance 10″, but this has gradually decreased [in 1889 only 5″], and the companion cannot now be distinguished except by a telescope of great power. [The periastron passage is timed for 1896. The companion is probaby not less than half the mass of Sirius, and it is instanced as the case of a star already approaching solidity and obscurity.]

Right Ascension 1880.	Declination 1880.	
$6^h\ 41^m$	$+\ 41°\ 12'$	1451, **Star Cluster in Auriga**, fairly rich, coarsely scattered, with a double star near the middle. Discovered by W. Herschel, 3 Feb., 1788.
$6^h\ 42^m$	$-\ 3°\ 3'$	1453, **Star Cluster in Monoceros.** Coarsely scattered, not rich, contains stars of 8 to 11 mag.
$6^h\ 42^m$	$-\ 20°\ 37'$	1454, **Star Cluster in Canis Major.** A magnificent object, described and recognised as a star cluster by Messier. The smallest astronomical telescope will suffice to distinguish separate stars in it. Seen with the lowest power of a refractor, the whole field of vision seems full of stars of various magnitudes. A splendid sight!
$6^h\ 42^m$	$+\ 59°\ 34'$	14, **Lyncis** (Σ 963). A very difficult double star. The primary is 6 mag., and of a golden colour; the companion 7.1 mag., and of a purple red, according to Struve. Distance 0.8″, position angle, 64.1°; the latter is slowly increasing, while the distance seems to diminish. A very powerful instrument is required to divide the companion from the primary.
$6^h\ 46^m$	$+\ 0°\ 36'$	1465, **Star Cluster in Monoceros.** 20′ in diameter, rich in small stars. Near the centre there is a triple star 8 and 9 mag., for which Burnham (1880) gives the following measurements: A B; distance 20.9″; position angle, 80°; A C; distance 8.6″, position angle, 281.9°.
$6^h\ 48^m$	$+\ 13°\ 20'$	38, **Geminorum** (Σ 982). Primary 5.4 mag., and yellowish, companion 7.7 mag., and blueish. Distance 6.3″, position angle, 164° (1878). The colours of both stars are relatively intense.
$6^h\ 48^m$	$+\ 18°\ 8'$	1467, **Star Cluster in Gemini.** A triangular cluster consisting of small stars densely crowded. The whole, in the average telescope, looks like a nebula. Discovered by W. Herschel, 30 Dec., 1783.
$6^h\ 51^m$	$-\ 13°\ 53'$	μ **Canis Majoris** (Σ 997), a yellowish star 4.7 mag., with a blueish companion 8 mag., distance 2.5″ (1878), slowly decreasing, position angle, 342°, apparently unchanged since 1831.
$6^h\ 52^m$	$+\ 10°\ 25'$	1474, **Star Cluster in Monoceros**, consisting of a large number of coarsely scattered stars of 10 to 11 mag.
$6^h\ 54^m$	$-\ 13°\ 32'$	1479, **Star Cluster in Canis Major**, somewhat scattered, 20′ in diameter. The stars are from 8 to 11 mag. Discovered by Herschel, 8 Feb., 1785.
$6^h\ 56^m$	$+\ 52°\ 56'$	Σ 1009, **Lyncis**, a double star 6.7 and 6.8 mag., both of a brilliant white colour. Distance 3″, position angle, 156°; this latter has probably decreased since Struve took the measurement in 1830.
$6^h\ 57^m$	$+\ 20°\ 45'$	ζ **Geminorum**, a star of a deep yellow colour, 3.7 mag., recognised as variable by J. Schmidt in 1844. The variation of brightness = 0.8 mag., and lasts 10 days $3^h\ 43^m$. The decrease in brilliancy is somewhat more rapid than the increase. ζ has two companions 7 and 10.5 mag. The first at distance 94″, position angle, 352°, the latter 87″, position angle, 84°.

Right Ascension 1880.	Declination 1880.	
$6^h\ 57^m$	$-\ 8°\ 10'$	1483, **Star Cluster in Monoceros**, discovered by Messier, 5 April, 1772, and described by him as a cluster of small stars of different magnitudes, near to a star of 7 mag. The cluster consists of stars ranging from 8 to 13 mag., one of them being red in colour. Diameter 30′.
$6^h\ 58^m$	$-\ 15°\ 27'$	γ **Canis Majoris.** According to Montanari, this star was scarcely visible in 1670; in 1693 Maraldi found it to be 4 mag. Later on Bode estimated it at 4.5 mag., and Flamsteed at 3 mag. It is apparently variable.
$7^h\ 0^m$	$+\ 22°\ 53'$	*R* **Geminorum.** A variable star, discovered by Hind in 1848. At maximum it is 6.5 mag., at minimum less than 12 mag. The star is of a deep red colour, and the variation in brilliancy is somewhat irregular. According to Schoenfeld, the brilliancy of the star at maximum is often the same for weeks at a time.
$7^h\ 0^m$	$+\ 27°\ 23'$	1490, **Star Cluster in Gemini**, discovered by W. Herschel, 11 Mar., 1785. A coarsely scattered cluster which contains within itself another cluster of small size. This latter, Rosse says, consists of six or seven stars of from 10 to 12 mag.
$7^h\ 2^m$	$+\ 10°\ 14'$	*R* **Canis Minoris.** A variable star, discovered at Bonn Observatory in 1854. At maximum it scarcely reaches 7 mag.; at minimum it is 9.5, sometimes 10 mag. Period, about 335 days. This star has so far received but little attention.
$7^h\ 4^m$	$-\ 26°\ 12'$	δ **Canis Majoris.** A red star, 2 mag., considered by Gould to be variable.
$7^h\ 10^m$	$+\ 13°\ 59'$	1508, **Star Cluster in Gemini**, consisting of numerous stars of 10 mag. and under. Irregularly round in shape and rather denser towards the centre. The whole is 4′ in diameter.
$7^h\ 11^m$	$+\ 16°\ 45'$	λ **Geminorum** (Σ 1061). A star of 4 mag., of a greenish-blue light, with a companion 10.3 mag. Engelmann (1882—87) calculates: distance 9.5″, position angle, 32.1°.
$7^h\ 12^m$	$+\ 73°\ 19'$	Σ 1051, **Camelopardalis**, triple, found to be so by Struve. The primary is 7, the nearest companion 9, the farther 7 mag. The former is at distance 1.2″, position angle, 268°, the latter at distance 31″, position angle 81.5°.
$7^h\ 12^m$	$-\ 13°\ 0'$	1511, **Nebula in Canis Major.** A large nebula, discovered by W. Herschel, 31 Jan., 1785, and described by him as resembling a parallelogram in shape, with a streak towards the south. The nebula has been imperfectly sketched by J. Herschel and Lassell. The best representation is that of Tempel. (Vide sheet xviii.)
$7^h\ 12^m$	$-\ 15°\ 25'$	1512, **Star Cluster in Canis Major**, discovered by Caroline Herschel. Large and rather dense.
$7^h\ 13^m$	$+\ 55°\ 30'$	19, **Lyncis** (Σ 1062). A star of 6.5 mag., with a companion 7.5 mag., distance 15″.
$7^h\ 13^m$	$+\ 22°\ 12'$	δ **Geminorum** (Σ 1066). A yellowish star, 3.2 mag., with a reddish companion 8.2 mag. Distance 7″, position angle, 205.2° (according to Engelmann, 1883).
$7^h\ 14^m$	$-\ 24°\ 44'$	1513, **Star Cluster in Canis Major**, fairly large, contains several brilliant stars. The brightest of these (30 Canis) is 6.5 mag., with several companions, one of 9 mag., distance 84″, position angle 78°.

Right Ascension 1880.	Declination 1880.	
$7^h\ 22^m$	$+ 14°\ 1'$	1534, **Star Cluster in Gemini,** fairly rich, contains about 40 stars of 10 mag., and several fainter ones. Lord Rosse saw in this place 70 stars of 11 mag. and under, within a space 15′ diameter.
$7^h\ 22^m$	$- 11°\ 19'$	Σ 1097, **Navis,** a star of 6 mag. with four companions. The primary (A) has a companion (B) at distance 20″, position angle, 312°, and another companion (C) at distance 20″, position angle, 311°. In 1875, Dembowski discovered that A is itself double, having a companion 8 mag., d=08″,p=166°. Then Burnham found another very faint star, d=31″p = 41°.
$7^h\ 25^m$	$-\ 9°\ 32'$	*U* **Monocerotis,** a variable star, identified as such by Gould in 1872. At maximum it is 6 mag., at minimum somewhat under 7 mag. Period of variability, 46 days.
$7^h\ 25^m$	$+ 65°\ 57'$	1541, **Nebula in Camelopardalis,** very large, rather elongated, moderately bright with an increase of brilliancy at the centre.
$7^h\ 26^m$	$+\ 8°\ 34'$	*S* **Canis Minoris,** recognised as variable by Hind in 1856. At maximum it is sometimes 7, but often only 8 mag., at minimum less than 11 mag. Period 332 days.
$7^h\ 27^m$	$+ 32°\ 9'$	α **Geminorum** (Castor), one of the most beautiful double stars in the heavens, 2.7 and 3.7 mag. It can be divided with a small telescope (distance 5.5″). Both stars give a greenish light. The period of revolution round their common centre of gravity is about 1,000 years. Near by are two stars 10 and 11 mag.
$7^h\ 31^m$	$+ 21°\ 50'$	1549, **Star Cluster in Gemini,** a beautiful object discovered by W. Herschel, 19 Nov., 1783. The stars are numerous and densely crowded. Diameter 6′.
$7^h\ 31^m$	$- 14°\ 14'$	Σ 1121, **Navis,** a double star, 7 and 7.5 mag., distance 7.5″. Close by is the double star Σ 1122, 6.5 and 8.5 mag., distance 19.6″. This belongs to the following cluster.
$7^h\ 31^m$	$- 14°\ 12'$	1551, **Star Cluster in Navis,** a rich group, 15′ in diameter, of small stars rather densely collected. Among them are some fairly brilliant stars. Discovered by W. Herschel, 4 Feb., 1875.
$7^h\ 33^m$	$+\ 5°\ 32'$	α **Canis Minoris** (Procyon), a brilliant star 1 mag. It has several very faint companions. Lamont saw one of them (B) at distance 57″, position angle, 262°. There is another small star at distance 327″, position angle, 84°, which is (as discovered by Bird) itself double. There is also another companion d = 643″ p = 99.7°. This too, is double (Σ 1126), and consists of two stars 6.5 and 7.5 mag., distance 1.5″. Burnham has also calculated the positions of two other companions of α: d = 97″ p = 22.7°, and d = 47.8″, p = 82.3°. This latter is very faint (13 mag.)
$7^h\ 36^m$	$+ 23°\ 44'$	*S* **Geminorum,** recognised as variable by Hind in 1848. The star is of a yellowish-red colour, and at maximum is scarcely 8 mag., at minimum it falls below 13 mag., or in other words disappears entirely, for the average telescope. Period 294 days. The variability is not quite regular.
$7^h\ 36^m$	$+ 64°\ 21'$	Σ 1127, **Camelopardal s.** Primary 6 mag. with one companion 8 mag., d=5.2″, p = 340°, and a second (10 mag.) d=11.2″ p = 175°

Right Ascension 1880.	Declination 1880.	
$7^h\ 36^m$	$-14°\ 32'$	1564, **Star Cluster in Navis,** extends over 30′, and is visible with a small telescope, discovered by Messier. The stars range from 7.5 to 11 mag. In this cluster W. Herschel found a faint, planetary nebula 2′ in diameter, which Rosse declares to be annular.
$7^h\ 37^m$	$-17°\ 55'$	1567, **Nebula in Navis.** A planetary nebula, somewhat blurred at the edges. It looks like a nebulous star in ordinary telescopes.
$7^h\ 37^m$	$+28°\ 30'$	*β* **Geminorum** (Pollux). A brilliant star of 1.5 mag., with several companions, all of which are very faint. W. Herschel saw one of them in 1784, South another in 1825, and Struve a third in 1836. Burnham was the first to obtain a complete view of the whole system, and he discovered that the nearest companion is itself double, 10 and 12.5 mag., but the distance is so small that it can be divided only with a very powerful telescope. Burnham gives the following measurements of the whole system, 1879-80.
		A B Distance 41.4″ Position angle 275.3°
		A C ,, 174.7″ ,, 71.2°
		A D ,, 206.3″ ,, 90.0°
		A E ,, 229.2″ ,, 75.3°
		C c ,, 1.4″ ,, 132.6°
		The double star C c is a very difficult object, even for the 18-inch refractor at Chicago. Burnham gives the magnitude of B as 13.5 ; D, 9.5 ; E, 9.
$7^h\ 37^m$	$+24°\ 41'$	*κ* **Geminorum.** A yellow star, 4 mag., with a companion 8.9 mag., distance 6.3″, position angle, 263°. The distance is probably slowly increasing, and the position angle also.
$7^h\ 39^m$	$+33°\ 44'$	*π* **Geminorum** (Σ 1135) a star of 6 mag., with a very faint companion 11 mag., distance 22″, position angle, 212°.
$7^h\ 39^m$	$-23°\ 35'$	1571, **Star Cluster in Navis,** discovered by Messier, 8′ in diameter, and fairly rich in stars of 8 mag. and under.
$7^h\ 42^m$	$-11°\ 54'$	5, **Navis** (Σ 1146). 5.6 mag., and yellowish, with a companion 7.8 mag., distance 3.4″.
$7^h\ 42^m$	$+24°\ 2'$	*T* **Geminorum.** Discovered to be variable by Hind in 1848. The star is red, and at maximum is 8 mag. ; at minimum it disappears. Schoenfeld found that the increase in light becomes much slower when once the star has reached 9.5 mag. On the whole, however, it gains more rapidly than it loses in brilliancy. Period 288 days, with slight fluctuations.
$7^h\ 48^m$	$+22°\ 19'$	*U* **Geminorum.** Recognised as variable by Hind in 1855, and one of the most remarkable stars of its kind The star is generally very faint, and without essential change, but at uncertain intervals it suddenly increases to 9 mag. Schoenfeld saw it gain as much as three magnitudes in 24 hours. No certain period can be given.
$7^h\ 52^m$	$+\ 2°\ 33'$	14, **Canis Minoris.** 5.5 mag., with two companions 7 and 8 mag., distance 76″ and 112″, position angle, 66° and 153°.
$7^h\ 54^m$	$-10°\ 27'$	1611, **Star Cluster in Monoceros.** A somewhat crowded cluster of stars, ranging from small to very faint. According to W. Herschel, who discovered the cluster 23 Feb., 1791, the crowded part is 5′ to 6′ in diameter.

Right Ascension 1880.	Declination 1880.	
$7^h\ 56^m$	$+\ 9°\ 46'$	1617, **Nebula in Canis Minor**, fairly faint, small (30″), elongated, with sudden increase of brilliancy at the centre.
$8^h\ 1^m$	$-\ 8°\ 54'$	Σ 1183, **Monocerotis**, a yellowish white star of 5.5 mag. with a companion 8 mag., distance 31″.
$8^h\ 3^m$	$-\ 2°\ 38'$	29, **Monocerotis** (Σ 1190), a yellowish star 5 mag. with two faint companions 9.5 and 9 mag., distance 31.6″ and 67″, position angle, 105°. and 245°.
$8^h\ 5^m$	$-12°\ 34'$	1630, **Star Cluster in Navis**, 20′ in diameter, coarsely scattered, rich in small stars, among them a double star. Discovered by W. Herschel, 31 Jan., 1785.
$8^h\ 5^m$	$+18°\ 1'$	ζ **Cancri** (Σ 1196), a triple star, consisting of a double star 5.5 and 6 mag., distance only 1″, and a farther companion 5.5 mag., distance 5.4″. W. Herschel saw the inner companion in 1781, but later on, neither he nor South could distinguish it. Struve was the first to find it again in 1826. [It seems now, from observations made by M. Seeliger and others, that these three bright stars are attendants on a dark body of greater mass than any one of them.]
$8^h\ 6^m$	$-12°\ 34'$	1632, **Navis**, a nebulous star, 6.7 mag.
$8^h\ 8^m$	$-\ 5°\ 26'$	1637, **Star Cluster in Monoceros.** Fairly large and crowded with stars of 9 mag., also a pretty double star.
$8^h\ 10^m$	$+12°\ 6'$	*R* **Cancri**, discovered to be variable by Schward in 1829. The star is yellowish red, at maximum 6.5, at minimum 12 mag. The period is 354 days and seems to be gradually lengthening.
$8^h\ 15^m$	$+17°\ 40'$	*V* **Cancri**, found to be variable by Auwers in 1870. At maximum it is under 7 mag., at minimum less than 12 mag. The period is nearly 270 days.
$8^h\ 20^m$	$+27°\ 20'$	φ^2 **Cancri** (Σ 1223), 6 mag. with a companion 6.5 mag., distance 5″, divided long ago by Chr. Mayer.
$8^h\ 20^m$	$+24°\ 56'$	υ^1 **Cancri** (Σ 1224) 6 mag. with a companion 7 mag., distance 5.9″.
$8^h\ 25^m$	$+18°\ 30'$	θ **Cancri**, a yellowish star 5.5 mag., with a faint companion, distance 61″.
$8^h\ 29^m$	$+\ 7°\ 2'$	Σ 1245, **Hydrae**, a star 6.5 mag., with a somewhat fainter companion, distance 10.3″, position angle 25°. No change in position has been noticed during the last 60 years.
$8^h\ 33^m$	$+20°\ 22'$	1681, **Star Cluster in Cancer**, visible to the naked eye, the so-called "Præsepe." With a telescope this cluster, which is very rich in stars, can be easily resolved.
$8^h\ 37^m$	$+19°\ 28'$	*S* **Cancri**, found to be variable by Hind in 1848. This somewhat yellowish variable belongs to the Algol type. At maximum it is 8.2, at minimum 9.8 mag. Period 9 days $11^h\ 38^m$. The decrease in brilliancy lasts $8\frac{1}{2}^h$; the increase 13^h.
$8^h\ 39^m$	$+29°\ 12'$	ι **Cancri** (Σ 1268) 4.5 mag. with a companion 6.5 mag., distance 30.7″, position angle, 307.3°. Discovered to be double by Herschel, 8 Feb., 1782.
$8^h\ 40^m$	$+78°\ 40'$	1691, **Nebula in Camelopardalis**, fairly bright, and tolerably large, with an increase of brilliancy towards the centre, at first gradual, then sudden.

Right Ascension 1880.	Declination 1880.	
$8^h\ 40^m$	+ 6° 51′	ε **Hydrae** (Σ 1273). A yellowish star, 3.5 mag., with a blueish companion 7.8 mag., distance 3.5″. Holden, with the great refractor at Washington, saw another very faint companion, d = 20″, p = 194°. [Schiaparelli finds the primary to be itself double, (1875—85).—Edit.]
$8^h\ 45^m$	+51° 46′	1711, **Nebula in Ursa Major,** fairly brilliant, large, brighter at first gradually, then suddenly towards the centre, where is a star 10 mag.
$8^h\ 45^m$	+12° 15′	1712, **Star Cluster in Cancer,** discovered by Messier, and described as a star cluster with nebula. Herschel resolved the whole into stars of from 8.5 to 12 or 13 mag. They number over 200. There does not seem to be any common centre to the cluster. A beautiful object!
$8^h\ 45^m$	+33° 53′	1713, **Nebula in Leo Minor.** A very faint nebula followed by a star of 8.5 mag. Rather more brilliant towards the centre.
$8^h\ 45^m$	— 6° 41′	15, **Hydrae.** This star, 6 mag., has (as discovered by Herschel) a companion 7 mag., at distance 46″, position angle, 356°. Burnham divided the primary into two points of light at 0.5″ distance, and found an additional companion at distance 50″, position angle, 52°.
$8^h\ 47^m$	+ 3° 31′	*S* **Hydrae,** variable, discovered by Hind in 1848. The star is a yellowish-red. At maximum it is sometimes 7.5, though often only 8 mag.; at minimum it is under 12 mag. Period 256.4 days.
$8^h\ 47^m$	+31° 2′	ι^2 **Cancri** (Σ 1291). 6 mag., with a companion 6.7 mag., distance 1.4″.
$8^h\ 50^m$	— 8° 41′	*T* **Hydrae.** Found to be variable by Hind in 1851. At maximum seems to be 7 mag., though often only 8 mag., at minimum it is under 12.5 mag. Period 289.4 days.
$8^h\ 51^m$	+48° 31′	ι **Ursa Majoris,** 3 mag., with a companion 10 mag., distance 10″, position angle, 357°.
$8^h\ 52^m$	+12° 19′	α **Cancri.** A star of 4 mag., with a very faint companion, distance 11.4″, position angle, 325°.
$8^h\ 54^m$	+32° 43′	66, **Cancri** (Σ 1298). A white star of 6.5 mag., with a companion 8 mag., distance 4.6″.
$8^h\ 54^m$	+28° 23′	67, **Cancri.** A star of 6.5 mag., with a remote satellite. It is at distance 103″, position angle, 323°.
$8^h\ 58^m$	+60° 59′	1750, **Nebula in Ursa Major,** rather faint, but extensive. Rosse's telescope shows this object as a formless, nebulous mass of an uneven character.
$9^h\ 0^m$	+67° 37′	σ^2 **Ursae Majoris** (Σ 1306). 5 mag., and somewhat greenish, with a companion 8 mag., distance 2.6″, position angle, 245°.
$9^h\ 1^m$	+23° 28′	Σ 1311, **Cancri.** A star of 7 mag., with a companion of equal brilliancy, distance 7″.
$9^h\ 2^m$	+60° 32′	1765, **Nebula in Ursa Major,** faint, fairly large, with a sudden increase of brightness towards the centre, with a kind of nucleus.
$9^h\ 8^m$	+69° 43′	1781, **Nebula in Ursa Major,** fairly brilliant and large, with an increase of brightness towards the centre, where there is a star. Herschel thought it resolvable.
$9^h\ 8^m$	+ 2° 47′	θ **Hydrae,** 4 mag., with a companion 11 mag., distance 53″, position angle, 175°.

Right Ascension 1880.	Declination 1880.	
$9^h\ 11^m$	$+35°\ 52'$	Σ 1333, **Lyncis**, 6.5 mag. with a companion 7 mag., distance 1.4″.
$9^h\ 11^m$	$+37°\ 19'$	31, **Lyncis** (Σ 1334), a star of 4 mag. with a companion 6.7 mag., distance 2.8″, position angle, 237°.
$9^h\ 12^m$	$+34°\ 15'$	1811, **Nebula in Lynx**, fairly brilliant, of moderate size and considerably brighter on its succeeding side. To the south are 3 small stars.
$9^h\ 14^m$	$+51°\ 30'$	1823, **Nebula in Ursa Major**, fairly brilliant, 6′ in diameter. In Rosse's telescope it shows some resemblance to the nebula in Andromeda.
$9^h\ 14^m$	$+50°\ 3'$	39, **Lyncis** (Σ 1340), 6.5 mag. with a faint companion 8.5 mag., distance 7″.
$9^h\ 21^m$	$+46°\ 8'$	41, **Ursae Majoris**, 6.5 mag. with companion 8 mag., distance, 82″, position angle, 162°.
$9^h\ 22^m$	$+\ 9°\ 34'$	ω **Leonis** (Σ 1356), a difficult double star 6 and 7 mag., both yellowish. The distance is, at times, so small, that even the most powerful telescopes show only an elongated star. Engelmann (1884) calculated: distance 0.66″, position angle, 91.4°. The motion of the companion seems to indicate 110 years as the period of revolution.
$9^h\ 22^m$	$+63°\ 35'$	23, **Ursae Majoris** (Σ 1351), 3.8 mag. with a companion 9 mag., distance 23″, position angle, 272°.
$9^h\ 23^m$	$-\ 2°\ 15'$	r^1 **Hydrae**, 5 mag., with a satellite 8 mag., distance 67″, position angle, 3°.
$9^h\ 25^m$	$+22°\ 2'$	1861, 1863, **Nebula in Leo**, large and brilliant, appearing as a double nebula in powerful telescopes; with a very strong instrument a third nebula is visible. According to Tempel, the whole is a large, spindle-shaped nebula, at least 15′ long, with 3 nodes, of which the southernmost is fainter than the northernmost, and the middle one is of a stellar nature and very brilliant. The spindle shape is ill-defined towards the north.
$9^h\ 26^m$	$+10°\ 15'$	6, **Leonis**, 6 mag., somewhat reddish, with a companion 9 mag., distance 38.8″, position angle, 74.3°. The position of the companion has not altered since Herschel's time.
$9^h\ 29^m$	$+14°\ 55'$	7, **Leonis**, a star of 6 mag. with a companion 8 mag., distance 42″, position angle, 79.5°.
$9^h\ 38^m$	$+35°\ 4'$	*R* **Leonis Minoris**, a variable star, indentified as such by Schoenfeld in 1863. At maximum it is 6 mag., sometimes only 7.5 mag.: at minimum it is under 11 mag. Period 375 days.
$9^h\ 39^m$	$+72°\ 50'$	1909, **Nebula in Ursa Major**, about one minute in extent, elongated, fairly brilliant, with a nucleus in the centre.
$9^h\ 41^m$	$+11°\ 59'$	*R* **Leonis**, a variable star, identified as such by Koch in 1782, of a deep red colour, and gives a peculiar spectrum. At maximum it is 5, at minimum 10 mag. Period 313 days.
$9^h\ 44^m$	$+54°\ 38'$	φ **Ursae Majoris**, an exceedingly close double star 5 and 5.5 mag., distance only 0.2″. It can only occasionally be divided even with the most powerful telescope.
$9^h\ 46^m$	$+69°\ 41'$	1949, 1950, **Nebula in Ursa Major**, two nebulæ discovered by Bode at 30′ distance from one another, the preceding one 15′ long, is the more brilliant of the two, and has a nucleus like a star of 8.5 mag. The succeeding one is smaller and fainter.

Right Ascension 1880.	Declination 1880.	
$9^h\ 48^m$	+ 5° 30′	9, **Sextantis.** A reddish star, 7 mag., with a companion 8 mag., distance 53″, position angle, 292°.
$9^h\ 59^m$	— 7° 7′	2008, **Nebula in Sextans,** discovered by Herschel, fairly brilliant with an increase of light towards the centre which resembles a star of 9.5 mag. Very faint when viewed with a small telescope.
$10^h\ 2^m$	+ 12° 33′	α **Leonis** (Regulus). A brilliant star with a beautiful spectrum. At distance 3′ is a star 8.5 mag., which has the same proper motion as α. There is an extremely faint companion at distance 3.3″, position angle, 88.5°.
$10^h\ 7^m$	+ 74° 0′	2024, **Nebula in Draco,** fairly brilliant, large, round, with an increase of brilliancy towards the centre, at first gradual then abrupt.
$10^h\ 8^m$	+ 4° 1′	2038, **Nebula in Sextans,** fairly brilliant, small, round, with a sudden increase of brightness towards the centre. It is followed in the field of vision by another fainter nebula not noticed by W. Herschel.
$10^h\ 13^m$	+ 20° 27′	γ **Leonis** (Σ 1424). A golden-yellowish star, 2 mag., with a greenish-red companion of 3.5 mag., distance 3.4″. According to Struve, the most beautiful star in the northern heavens. Singularly enough, W. Herschel gives both stars as white. [It has been calculated that if this star be of equal density with the sun, then it is three hundred times more brilliant than the latter. If we suppose its light equal to that of the sun, then its density must be seven times rarer than air at standard pressure. A. M. Clerke, *System of the Stars*, p. 203.]
$10^h\ 19^m$	— 18° 2′	2102, **Nebula in Hydra.** A planetary nebula nearly 1′ in diameter, fairly brilliant. W. Herschel saw no traces of a starry nature in it. To Secchi, on the other hand, it appeared quite differently; within a circular nebula he distinguished two star clusters, which are bound together by a shining ring composed of two semicircles of stars. There is also a star in the nebulous space at the centre. Tempel thinks the nebula very wonderful. He considers it to be a small, oval, brilliant disc of light surrounded by sharply defined, densely collected stars. In the southern central and northern portions shine out a few stars of greater brilliancy. "These," says Tempel, "like living, pulsating points, form a striking contrast to the dark background, which is totally free from nebula."
$10^h\ 21^m$	+ 29° 7′	2104, **Nebula in Leo Minor,** fairly brilliant, elliptical in shape, with a kind of brilliant nucleus in the centre.
$10^h\ 29^m$	+ 9° 16′	49, **Leonis** (Σ 1450). 6 mag., with a companion 9 mag., at distance 2.4″, the position of which does not seem to alter.
$10^h\ 31^m$	+ 54° 8′	2158, **Nebula in Ursa Major,** planetary, with blurred edges, containing 2 stars of 10 mag.
$10^h\ 36^m$	+ 69° 24′	*R* **Ursae Majoris.** A variable star, recognised by Pogson in 1853. At maximum it is sometimes 6, though often only 8 mag., at minimum 12 mag. Period, 303 days.
$10^h\ 37^m$	+ 25° 33′	2178, **Nebula in Leo Minoris,** fairly bright, with an increase of brilliancy towards the centre. There is a star surrounded by the nebula. Rosse sees spiral coils round a luminous centre.
$10^h\ 37^m$	+ 12° 20′	2184, **Nebula in Leo,** discovered by Méchain, and described as a very faint starless nebula; it really is fairly brilliant, large and round, brighter at the centre, with a nucleus resembling a star of 10 mag.
$10^h\ 37^m$	+ 5° 23′	35, **Sextantis** (Σ 1466). 6.5 mag., with a companion 7 mag., distance 67″, position angle, 240°

Right Ascension 1880.	Declination 1880.	
$10^h\ 40^m$	+ 12° 27′	2194, **Nebula in Leo,** very brilliant, irregularly round in shape, with a nucleus, probably resolvable.
$10^h\ 42^m$	+ 13° 16′	2203, 2207, **Nebula in Leo,** double, fairly brilliant and large, the second nebula has a nucleus like a star of 9.5 mag. A third very faint nebula follows and forms a triangle with the other two.
$10^h\ 45^m$	— 8° 10′	41, **Sextantis.** Triple. The primary is 5, the farther companion 9, the nearer 11 mag. Burnham gives (1879) the following measurements: A B d = 26.9″, p = 304°; A C d = 233″, p = 72°. This companion is not visible except in a very powerful telescope.
$10^h\ 47^m$	+ 57° 37′	2245, **Nebula in Ursa Major.** Fairly brilliant, of moderate size, and irregularly circular in shape, gradually brighter towards the centre. Followed to the northward by a star 10 mag., distance 2′.
$10^h\ 49^m$	+ 25° 24′	54, **Leonis** (Σ 1487), a star 4.5 mag. with a blueish companion 7 mag., distance 6.5″.
$10^h\ 52^m$	+ 59° 33′	Σ 1495, **Ursae Majoris,** 6 mag., yellowish, with a companion 8 mag., distance 34″.
$10^h\ 53^m$	+ 29° 37′	2274, **Nebula in Leo Minor,** large, brilliant, supposed by Herschel to be a globular star cluster at an immeasurable distance.
$10^h\ 54^m$	+ 4° 16′	2279, **Nebula in Leo.** According to Tempel, this is a large and thick spindle-shaped nebula 5′ long by 1.5′ broad, with 3 distinct nebula nodes in its major axis. In all of these faint stars are visible. About 6′ north of the middle node, Tempel repeatedly observed a small nebula.
$10^h\ 54^m$	+ 62° 50′	[α **Ursae Majoris.** Seen as a double star by the large telescope at Mount Hamilton.]
$10^h\ 55^m$	+ 57° 2′	β **Ursae Majoris.** A greenish-white star, 2.3 mag., with a very faint companion, distance 245″, position angle, 354°.
$10^h\ 57^m$	+ 28° 37′	2287, **Nebula in Leo Minor,** fairly brilliant, with what looks like a nucleus in the centre. According to Herschel this nebula is really a resolvable star cluster.
$10^h\ 59^m$	+ 0° 37′	2301, **Nebula in Leo,** fairly large, oval, with a star-shaped nucleus. Several stars follow it.
$11^h\ 4^m$	+ 56° 19′	2318, **Nebula in Ursa Major,** discovered by W. Herschel, 7 April, 1789, elongated, fairly brilliant, with a star in the centre. According to Herschel, however, the latter is merely accidentally projected on the nebula.
$11^h\ 8^m$	+ 55° 40′	2343, **Nebula in Ursa Major,** large, planetary, discovered by Méchain in 1781. According to J. Herschel it is 2′ 40″ in diameter and of uniform brilliancy throughout. Rosse sees two dark openings in the nebula with a star in each. Huggins considers it to be a mass of incandescent gas. [This is the well-known "Owl Nebula." Like every other planetary nebula it gives a spectrum of bright lines, showing it to be a globular mass of glowing gases. It would contain, it is said, thousands of solar systems within its bulk. *System of the Stars,* Clerke, p. 256.]
$11^h\ 9^m$	+ 53° 26′	Σ 1520, **Ursae Majoris.** A star of 6 mag., with a companion 8 mag., distance 13″.
$11^h\ 9^m$	+ 18° 46′	2352, **Nebula in Leo.** A faint nebula, considered by d'Arrest to be variable. Schoenfeld found it to be brilliant in 1861, but in 1863 it was occasionally invisible. At present it is very faint.
$11^h\ 11^m$	+ 59° 26′	2360, **Nebula in Ursa Major,** fairly brilliant, but small, with a nucleus.
$11^h\ 12^m$	+ 58° 39′	2362, **Nebula in Ursa Major,** fairly brilliant, of moderate size, much brighter towards the centre, with what seems to be a nucleus.
$11^h\ 12^m$	+ 32° 12′	ξ **Ursae Majoris** (Σ 1523). A yellowish star, 4 mag., with a greyish-white companion 5 mag. This latter moves with great rapidity, its period of revolution being only 60 years. Distance in 1882 1.9″, but now rapidly increasing. [Struve deduced from Mädler's elements of ξ Ursae Majoris a mass equal to 159 times that of the sun.]

Right Ascension 1880.	Declination 1880.	
$11^h\ 12^m$	$+\ 33°\ 45'$	ν **Ursae Majoris** (Σ 1524), yellowish 3.5 mag., with a very faint companion 10.5 mag., distance 7″, position angle, 147°.
$11^h\ 14^m$	$+\ 13°\ 39'$	2373, 2377, **Nebulæ in Leo**, double, fairly brilliant, the succeeding one being brightest. The nebulae are spiral-shaped with central nuclei which seem to be surrounded by elliptical rings. The nebula 2373 is 7′ long by 2′ broad, the other 5′ long by 2½′ broad.
$11^h\ 18^m$	$+\ 11°\ 11'$	l **Leonis** (Σ 1536), a yellowish star 4 mag. with a blueish companion 7 mag., distance 2.8″.
$11^h\ 22^m$	$+\ 3°\ 31'$	τ **Leonis**, 5 mag., yellowish with a white companion 7 mag., distance 93″. Easily observed.
$11^h\ 23^m$	$+\ 39°\ 59'$	57, **Ursae Majoris** (Σ 1543), 5 mag, with a companion 8 mag., distance 5.4″, position angle, 7°.
$11^h\ 26^m$	$-\ 28°\ 36'$	**In Hydra**, two stars, 5.5 and 6.5 mag., distance 8.7″.
$11^h\ 26^m$	$+\ 15°\ 2'$	88, **Leonis** (Σ 1547), yellowish 6.5 mag., with a faint companion 9.3 mag., distance 15″, position angle, 320°.
$11^h\ 28^m$	$+\ 17°\ 28'$	90, **Leonis** (Σ 1552), a star of 6 mag., with a companion 7.5 mag., distance 3″, position angle 209.4°. At distance 63″, position angle 234°, is a star of 9.5 mag.
$11^h\ 32^m$	$+\ 45°\ 46'$	Σ 1561, **Ursae Majoris**, 6.5 mag., with a companion 8 mag., distance 10″.
$11^h\ 42^m$	$+\ 20°\ 53'$	93, **Leonis**, 4 mag., with a companion 8.4 mag., distance 74″.
$11^h\ 43^m$	$+\ 15°\ 15'$	β **Leonis**, 2 mag., with a very beautiful spectrum, has a number of faint stars in its vicinity. Knott gives the following magnitudes and positions : B 8 mag. C 10 mag. D 7 mag. E 12 mag. F 11 mag. A B 4′ 42″ distance. 206.2° position angle. A C 11′ 30″ „ 186.9° „ A D 19′ 30″ „ 201.6° „ A E 5′ 3″ „ 116.1° „ A F 10′ 0″ „ 120.0° „ Burnham found another star at distance 77″, position angle 345°. He also found D to be a very close double star 6 and 11 mag., distance 1.5″.
$11^h\ 47^m$	$+\ 37°\ 39'$	2600, **Neubla in Ursa Major**, a fairly brilliant nebula 3′ to 4′ in diameter, with an increase of density towards the centre.
$11^h\ 49^m$	$+\ 47°\ 9'$	65, **Ursae Majoris** (Σ 1579), 6 mag., with a blueish companion 8.5 mag., distance 3.7″. There is also a star of 6.5 mag. at distance 114″.
$11^h\ 52^m$	$+\ 54°\ 3'$	2635, **Nebula in Ursa Major**, a faint nebulous appearance between two stars, 7′ long by 4′ broad, according to Herschel. Tempel estimates it as at the most only 2½′ in diameter, and says he sees 3 brilliant stars round its speckled centre.
$11^h\ 53^m$	$+\ 51°\ 37'$	2660, **Nebula in Ursa Major**, discovered by W. Herschel, 12 April 1789, brilliant 5′ long by 1½′ broad, increasing in brightness towards the centre, with a brilliant nucleus.
$11^h\ 57^m$	$+\ 45°\ 12'$	2680, **Nebula in Ursa Major**, brilliant, fairly large, with a sudden increase of brightness towards the centre. Rosse finds it to be of spiral structure.

Right Ascension 1880.	Declination 1880.	
$11^h\,58^m$	+ 22° 8′	2, **Comae Berenices** (Σ 1596), 6 mag., with a companion 7.5 mag., distance 3.7″.
$12^h\,1^m$	+ 43° 44′	2723, **Nebula in Canes Venatici**, fairly bright, elongated, with a very brilliant nucleus. Discovered by Herschel 14 Jan., 1788.
$12^h\,4^m$	+ 19° 13′	2752, **Star Cluster in Coma Berenices**, of moderate size, very brilliant, globular, the stars are more densely collected towards the centre.
$12^h\,5^m$	+ 40° 33′	Σ 1606, **Canum Venaticorum**. A star of 6 mag., with a companion 7 mag., distance 1.4″.
$12^h\,7^m$	+ 15° 34′	2786, **Nebula in Coma Berenices**, a large pale nebula 15′ long, with a star-like centre. Discovered by Méchain 5 Mar., 1781. Tempel found another small round nebula to the southward.
$12^h\,10^m$	+ 41° 20′	2, **Canum Venaticorum** (Σ 1622), a reddish star 5.5 mag., with a blueish companion 8 mag., distance 11.4″, position angle, 260°. The colours are fairly decided.
$12^h\,10^m$	+ 13° 48′	2806, **Nebula in Virgo.** 9′ to 10′ long, brighter in the centre. Discovered by Herschel 8 April 1784. It is spindle shaped, and Tempel saw two accompanying nebula. The one preceding it to the south is 5′ long, oval in shape, and has 3 brilliant nodes; it is situated towards the centre of the principal nebula :—35^s —6½′. To the south there follows a small star 10—11 mag. The companion nebula on the north, which follows it, is round, 1′ in diameter, and very faint.
$12^h\,12^m$	— 3° 17′	Σ 1627, **Virginis**, 6 mag., with a companion 6.5 mag., d = 20″, p = 196°.
$12^h\,13^m$	+ 15° 4′	2838, **Nebula in Coma Berenices.** Discovered by Méchain 15 Mar., 1781, and described as a starless nebula. Vogel observed it with the 8-inch refractor at Leipsic, and found it to be large, brilliant, and apparently resolvable at the centre, where there are two bright starlight points. With magnifying power 192, a spiral arrangement was visible.
$12^h\,13^m$	+ 47° 59′	2841, **Nebula in Ursa Major**, brilliant, with a nucleus, fairly large. Discovered by Herschel. No trace of resolvability. A continuous spectrum shows that this nebula is a very distinct star cluster.
$12^h\,13^m$	— 18° 35′	*R* **Corvi**, recognised as variable by Karlinski in 1867. At maximum it generally reaches 7 mag.; at minimum it is 11.5 mag. Period 319 days.
$12^h\,16^m$	+ 5° 8′	2878, **Nebula in Virgo.** Discovered by Messier 1779. A very faint nebula in which Herschel recognised two nuclei.
$12^h\,16^m$	+ 26° 31′	12 **Comae Berenices**, 5 mag., with a companion 8 mag. Distance 66″, position angle 169°.
$12^h\,17^m$	+ 16° 29′	2890, **Nebula in Coma Berenices.** Discovered by Méchain 15 Mar., 1781, fairly large, round and faint.
$12^h\,19^m$	+ 13° 34′	2930, **Nebula in Virgo**, a fairly brilliant, circular nebula, which suddenly increases in brightness towards the centre. Discovered by Messier.
$12^h\,19^m$	+ 18° 52′	2946, **Nebula in Coma Berenices.** Discovered by Méchain, and described as faint and starless. Herschel calls it brilliant. A star 9 mag., follows 2′ southward.

Right Ascension 1880.	Declination 1880.	
$12^h\ 20^m$	$+13°\ 36'$	2961, **Nebula in Virgo.** Comes into sight at the same moment as the nebula 2930, brilliant, round, with nucleus in the centre. Also discovered by Messier, 3′ to 4′ in diameter.
$12^h\ 21^m$	$+31°\ 53'$	2972, **Nebula in Coma Berenices,** fairly brilliant and large, increasing in brightness towards the centre, at which there is a star.
$12^h\ 22^m$	$+44°\ 45'$	3062, **Nebula in Canes Venatici,** fairly brilliant and large, was resolved into stars by Herschel's great telescope.
$12^h\ 23^m$	$+26°\ 34'$	17, **Comae Berenices.** A star of 5.5 mag., with a companion 6 mag., distance 145″.
$12^h\ 24^m$	$+\ 8°\ 40'$	3021, **Nebula in Virgo.** Discovered by Oriani in 1771, and described by Messier as a nebula, which can be seen, but with difficulty, in a $3\frac{1}{2}$-foot telescope. On right and left is a star of 6 mag. An insignificant object in small instruments.
$12^h\ 24^m$	$+42°\ 18'$	3041, 3042, **Nebula in anes Venatici.** A double nebula. The preceding one is faint, fairly small, and irregular in shape, the other which follows 3′ to the south is larger and more brilliant. In Herschel's telescope it was partly resolvable into stars.
$12^h\ 24^m$	$-15°\ 51'$	δ **Corvi** 2.5 mag. with a companion 8 mag., distance 23″, position angle 214°.
$12^h\ 25^m$	$+13°\ 3'$	3035, **Nebula in Virgo.** Discovered by Messier, of moderate brilliancy round and large, brightest in the centre.
$12^h\ 25^m$	$+26°\ 26'$	3043, **Nebula in Coma Berenices,** faint, round, with nucleus.
$12^h\ 26^m$	$+15°\ 5'$	3049, **Nebula in Virgo.** Discovered by Messier in 1781, and described as a starless nebula, situated between two stars of 6 mag., which come into view at the same moment. It is elliptical, and the northern part is brighter than the southern. Lassell and Vogel have made maps of this nebula.
$12^h\ 28^m$	$+\ 8°\ 21'$	3075, **Nebula in Virgo,** of moderate brilliancy, with a sudden increase of brightness towards the centre. Preceded by a star of 9 mag.
$12^h\ 29^m$	$+19°\ 2'$	24, **Comae Berenices** (Σ 1657), 5 mag. and yellow, with a blueish companion 6 mag. Distance (1863) 20″, position angle 271°.
$12^h\ 30^m$	$+13°\ 13'$	3097, **Nebula in Virgo.** Discovered as a very faint starless nebula by Messier; it is round and brighter towards the centre. Vogel observed it with the Leipsic Refractor, and describes it as very brilliant, 2′ in extent, suddenly denser at the centre, with a brilliant nucleus.
$12^h\ 30^m$	$+28°\ 37'$	3101, **Nebula in Coma Berenices.** Fairly bright and large, gradually more brilliant towards the centre. Three stars follow it.
$12^h\ 30^m$	$+12°\ 6'$	3105, **Nebula in Virgo,** a faint, double nebula, coming into view at the same moment as two others still fainter. Tempel has made a map of the whole with the neighbouring stars.
$12^h\ 30^m$	$+26°\ 39'$	3106, **Nebula in Coma Berenices,** a somewhat faint nebula, very large, 3-4′ in breadth, brighter towards the centre, with a nucleus like a star of 10 mag. Preceded by four faint stars.

Right Ascension 1880.	Declination 1880.	
$12^h\ 31^m$	$+\ 60°\ 9'$	*T* **Ursae Majoris**, recognised as variable at Bonn in 1860. At maximum it is sometimes 7, though often only 8 mag.; at minimum under 13. Period 256 days. The star is of a reddish-yellow colour.
$12^h\ 32^m$	$+\ 12°\ 29'$	3121, **Nebula in Virgo.** Discovered by Messier in 1779, and described as a very faint nebula. John Herschel calls it brilliant, large, irregularly round, bright towards the centre, and probably capable of being resolved into stars.
$12^h\ 32^m$	$+\ 7°\ 39'$	*R* **Virginis**, a reddish-yellow star, whose variability was recognised by Harding in 1809. At maximum it is 6·5 to 7·5 mag.; at minimum 10 to 11 mag. Period 146 days.
$12^h\ 33^m$	$-\ 26°\ 5'$	3128, **Nebula in Hydra.** Discovered by Messier in 1780, and described by him as a very faint starless nebula not easy to distinguish. Near it is a star of 6 mag. In 1786 the nebula was resolved into separate stars by F. W. Herschel's 20-foot reflector, these being very densely collected towards the centre. The cluster is 4′ long by 3′ broad.
$12^h\ 34^m$	$-\ 10°\ 58'$	3132, **Nebula in Virgo.** An elongated, elliptical nebula, brighter at the centre. With a low magnifying power several stars come into view at the same time as the nebula.
$12^h\ 35^m$	$-\ 12°\ 20'$	Σ 1669, **Yirginis.** A star of 6 mag., with a companion of nearly equal magnitude. Distance 5.8″.
$12^h\ 36^m$	$-\ 0°\ 47'$	**γ Virginis** (Σ 1670), a yellowish star 3 mag., with a somewhat fainter companion. This latter is at present easy to observe (d = 5.2″, p = 336°, 1882): its period of revolution is 170 years. There is also another faint star (11.5 mag.), d = 103″, p = 80°.
$12^h\ 36^m$	$+\ 33°\ 12'$	3165, **Nebula in Canes Venatici**, a strip of nebula 12′ long, but faint, with a small star in the centre.
$12^h\ 38^m$	$+\ 2°\ 39'$	3176, **Nebula in Virgo**, somewhat faint, starless, brightest at the centre.
$12^h\ 38^m$	$+\ 12°\ 13'$	3182, **Nebula in Virgo.** Discovered by Messier, who, however, did not see a faint nebula which precedes it. Somewhat faint. As seen with the Leipsic refractor, it seems capable of being resolved into stars.
$12^h\ 39^m$	$+\ 61°\ 45'$	*S* **Ursae Majoris**, of a reddish-yellow, recognised as variable by Pogson in 1853. The changes of brilliancy are somewhat irregular. At maximum it is 8, at minimum 10, sometimes 11 mag. Period 225 days is, apparently, slowly increasing.
$12^h\ 39^m$	$+\ 15°\ 2'$	Σ 1678, **Comae Berenices**, 6 mag., with a companion 7 mag., distance 32″.
$12^h\ 42^m$	$-\ 5°\ 9'$	3227, **Nebula in Virgo**, fairly large, but not very brilliant, increasing in brilliancy towards the centre, with a kind of nucleus which Herschel thought resolvable into stars.
$12^h\ 45^m$	$-\ 9°\ 41'$	Σ 1682, **Virginis**, 6.5 mag., yellowish, with a reddish companion 9 mag., d = 32″, p = 307°.
$12^h\ 45^m$	$+\ 41°\ 47'$	3258, **Nebula in Canes Venatici.** Discovered by Méchain, and described by him as a starless nebula, of fair brilliancy, 2.5′ in diameter, with brilliant centre. Several stars come into view at the same moment as this nebula, one of them a double star which follows it.

Right Ascension 1880.	Declination 1880.	
$12^h\ 45^m$	$+\ 6°\ 12'$	*U* **Virginis**, recognised as variable by Harding in 1831. The star is reddish, and at maximum 8 mag., at minimum 13 mag. Period nearly 207 days.
$12^h\ 47^m$	$+\ 11°\ 53'$	3278, **Nebula in Virgo.** Two faint nebulæ at 8′ to 10′ distance from one another. Discovered by W. Herschel on 15 March, 1784. The preceding nebula is long and thin and has an elongated nucleus.
$12^h\ 47^m$	$+\ 21°\ 54'$	35, **Comae Berenices**, (Σ 1687), 5 mag. and yellowish, with a blueish companion 8 mag., distance 1.3″, and a second companion 9 mag., distance 28.5″.
$12^h\ 49^m$	$-\ 11°\ 56'$	3293, 3294, **Nebulæ in Virgo**, double, faint, with other small, faint nebulæ in the vicinity. Tempel has made a map of this group of nebulæ.
$12^h\ 50^m$	$+\ 38°\ 58'$	Σ 1692, **Canum Venaticorum.** The brightest star in the constellation and known by the name of "Cor Caroli." The star is a little over 3 mag., and has a companion 6 mag. at distance 20″, in whose position no change has yet been observed.
$12^h\ 51^m$	$+\ 54°\ 44'$	Σ 1695, **Ursae Majoris**, 6.5 mag. with a companion 8 mag., d = 3.2″, p = 287°.
$12^h\ 53^m$	$+\ 14°\ 49'$	3342, **Nebula in Coma Berenices.** A brilliant nebula of fair size with a core-like density at the centre. There is a small star in this nebula.
$12^h\ 56^m$	$+\ 11°\ 36'$	ε **Virginis**, a star of 4 mag., with a very faint companion (12 mag.), d = 241″ p = 120°.
$13^h\ 4^m$	$+\ 18°\ 10'$	42, **Comae Berenices** (Σ 1728). Two stars of 5 mag., but whose distance is so small that they may be considered one of the most difficult of double stars. Struve, who discovered their duplex character in 1827, could generally only distinguish an elongated star, actual division being only occasionally possible. Dembowski too, in 1863, saw only an elongated star; Burnham, however, in 1879, measured the distance as 0.67″, position angle, 192°. Since 1882 the division has been easier than heretofore, but still requires an instrument of the first-class. [These stars oscillate to and fro in about 26 years, oculting each other twice in a revolution.]
$13^h\ 4^m$	$+\ 39°\ 8'$	15, 17, **Canum Venaticorum**, two stars of nearly equal brilliancy, 5.5 mag. The distance is 4′ 30″, still they cannot be divided without a telescope.
$13^h\ 4^m$	$-\ 4°\ 54'$	θ **Virginis**, triple, 4.5, 9 and 10 mag. The nearer companion is d = 7.1″, p = 344°, the farther and fainter, d = 71″, p = 297°.
$13^h\ 5^m$	$+\ 37°\ 42'$	3437, **Nebula in Canes Venatici**, a fairly brilliant nebula, 6′ long by 1.5′ broad, discovered by Herschel 1 May, 1785. Increases abruptly in brilliancy towards the centre, where it has what looks like a nucleus.
$13^h\ 7^m$	$+\ 18°\ 48'$	3453, **Star Cluster in Coma Berenices.** Discovered by Messier in 1777, and described as a starless nebula. In reality it is a star cluster in which, according to Rosse, 4 or 5 condensations are visible. A very beautiful object.

Right Ascension 1880.	Declination 1880.	
$13^h\ 10^m$	$+\ 42°\ 40'$	3474, **Nebula in Canes Venatici.** Discovered by Méchain in 1779, and described as a faint and starless nebula. According to Herschel, it is 10′ long by 4′, with a bright nucleus. Huggins finds that it gives a continuous spectrum, which proves it to be a star cluster at an immeasurable distance.
$13^h\ 18^m$	$-\ 10°\ 3'$	[α **Virginis (Spica).** Professor Vogel announced on April 24, 1890, that this consists of two close stars (companion obscure) of equal mass, revolving round their common centre of gravity in 4·0134 days. The spectrum is of Class IV.—Ed.]
$13^h\ 19^m$ *See *Nature* Feb. 27, 1890 p. 403.	$+\ 55°\ 33'$	ζ **Ursae Majoris,** 2 mag., and greenish-white, with a companion 4.5 mag., distance 14″. One of the most beautiful double stars in the heavens. At 11′ 47″ distance from ζ is g or Alkor, and, in addition, a star 8 mag., distance 8.5′, together with several fainter ones.
$13^h\ 20^m$	$-\ 2°\ 45'$	*W* **Virginis,** recognised as variable by Schoenfeld in 1866. At maximum it is 9 mag., and at minimum 10 to 10.4 mag. Period 17.3 days. The change of brilliancy is very uniform.
$13^h\ 23^m$	$-\ 22°\ 40'$	*R* **Hydrae,** a deep red star, recognised as variable by Maraldi in 1704. At maximum it is 4 to 5.5 mag., at minimum 10 mag. Period 437 days, formerly it seems to have been longer.
$13^h\ 25^m$	$+\ 47°\ 49'$	3572, **Nebula in Canes Venatici.** Discovered by Messier in 1773, and described as a faint, starless nebula, but double, each portion being bright in the centre, and 4½′ in diameter. W. Herschel describes it as a brilliant, circular nebula, surrounded by a faint, nebular halo and accompanied by a second nebula. J. Herschel's description and drawing were also wrong. Rosse's telescope showed the true structure of the nebula, *i.e.*, a spiral mass which seems to be wound round a brilliant centre (*Vide* Plate xvi). These spiral coils have also been clearly distinguished and mapped out by Vogel, with the help of the Leipsic 8-inch refractor. It would thus seem that we have here a mass of a really nebulous character coiling in vast convolutions round an enormous centre, yet spectrum analysis contradicts this theory. The nebula has a continuous spectrum similar to that of the stars, and without any bright lines, which are never absent from the spectra of true incandescent nebulæ. [Mr. Roberts' photograph, taken 1889, in four hours' exposure, gives clearer details of the arrangement of this nebula.]
$13^h\ 27^m$	$-\ 6°\ 35'$	*S* **Virginis,** recognised as variable by Hind in 1852; the change of brilliancy is somewhat irregular. At maximum the star is 6 mag., sometimes only 8 mag., at minimum under 12 mag. Period 374 days.
$13^h\ 32^m$	$-\ 17°\ 16'$	3614, **Nebula in Virgo,** faint; according to Lassell, a spiral with two arms.
$13^h\ 32^m$	$+\ 36°\ 55'$	25, **Canum Venaticorum** (Σ 1768). A star of 5 mag., with a companion 7.5 mag., distance (when discovered by Struve in 1829), 1.05″. It has decreased since then, and Engelmann, in 1883, calculated it as 0.8″. The companion's position angle was 151°. Apparently the distance is now increasing again.
$13^h\ 32^m$	$+\ 9°\ 30'$	3615, **Nebula in Virgo,** brilliant, 9′ to 10′ in length, with two nebulous nodes in the centre. There is one star to the south of it, and several fainter ones to the north. Tempel discovered some very faint nebulæ in its vicinity.

Right Ascension 1880.	Declination 1880.	
$13^h\ 35^m$	$+20°\ 34'$	1, **Bootis**, (Σ 1772), a star of 6 mag., with a faint companion 9 mag., distance 4.8″.
$13^h\ 37^m$	$+\ 4°\ 9'$	84, **Virginis** (Σ 1777), 6 mag., with a companion 8 mag., distance 3.5″.
$13^h\ 37^m$	$+28°\ 59'$	3636, **Star Cluster in Canes Venatici**, discovered by Messier and described as a brilliant nebula. Herschel first resolved it, in 1783, into a star cluster containing upwards of 1,000 stars. A splendid object!
See 26 Dec.,	*Nature*, 1889, p. 183.	
$13^h\ 37^m$	$+36°\ 16'$	3637, **Nebula in Bootes**, of moderate brilliancy, fairly large, circular, brighter in the centre.
$13^h\ 42^m$	$+18°\ 3'$	τ **Bootis**, a star of 4.5 mag., with a very faint companion, d = 8.5″, p = 352°.
$13^h\ 43^m$	$+49°\ 55'$	μ **Ursae Majoris**, 3 mag. According to Gemmil, who is supported by Espin, this star is variable. Period $4\frac{3}{4}$ days. More exact information is not forthcoming.
$13^h\ 56^m$	$+\ 2°\ 7'$	τ **Virginis**, a star of 4 mag., with a faint companion 8.5 mag., d=79″, p = 290°.
$14^h\ 8^m$	$+19°\ 38'$	*T* **Bootis**, a star of 9.5 mag., seen by Baxendall 9th April, 1860; on 11th of April it was 10 mag., and on 20th 13 mag., on the 23rd it became invisible, and has not since been seen.
$14^h\ 9^m$	$+52°\ 22'$	$\varkappa$ **Bootis**, (Σ 1821), a star of 4 mag., of a greenish-white colour with a bluish companion at 12.7″ distance.
$14^h\ 10^m$	$+19°\ 49'$	α **Bootis (Arcturus)**, a brilliant star 1 mag., with a beautiful spectrum (Vogel, class IIa.) Its colour is a bright reddish yellow. At distance 43″ is a star of 9 mag. [See Note p. 71.]
$14^h\ 12^m$	$+51°\ 55'$	*l* **Bootis.** This star 4.5 mag. has a companion 7.5 mag., at distance 38″. Struve (1836) saw the primary as double; Mädler, too, in 1842, believed he could do so; since then no similar observation has been made, and its duplex nature is, therefore, doubtful.
$14^h\ 19^m$	$+54°\ 21'$	*S* **Bootis.** A variable star of a reddish colour, discovered at Bonn in 1860. At maximum it is 8 mag., at minimum it becomes invisible. Period 272 days.
$14^h\ 22^m$	$-\ 1°\ 41'$	φ **Virginis** (Σ 1846), 5 mag., with a companion 10 mag., d = 4″, p = 108.5°.
$14^h\ 23^m$	$-\ 5°\ 26'$	3900, **Nebula in Virgo**, of moderate brilliancy, small, condensed at the centre, thought by J. Herschel capable of being resolved.
$14^h\ 23^m$	$+28°\ 49'$	Σ 1850, **Bootis**, 6.5 mag., with a companion 7 mag., d = 25″, p = 263°.
$14^h\ 32^m$	$+27°\ 16'$	*R* **Bootis**, a variable star, at maximum it is 6 mag., and reddish in colour, at minimum it sinks to 12 mag. Period 223 days. Recognised as variable at Bonn in 1858.
$14^h\ 34^m$	$+\ 0°\ 14'$	3964, **Nebula in Virgo**, discovered by W. Herschel 11 April, 1787, and classed by him among the brilliant nebula. J. Herschel considered it capable of being resolved into stars.
$14^h\ 35^m$	$+16°\ 56'$	π **Bootis** (Σ 1864), a star 4 mag., with an easily distinguished companion 6 mag., distance 6.6″.

Right Ascension 1880.	Declination 1880.	
$14^h\ 35^m$	+ 14° 15′	ζ **Bootis** (Σ 1865). The primary 3.5 mag., has two companions, the nearer 4 mag., is at present so close to the primary that only instruments of the first class can distinguish it. According to Perrotin, the distance in 1883 was 0.6″, the position angle, 297°. The farther companion is at distance 90″, position angle 27°.
$14^h\ 40^m$	+ 27° 35′	ε **Bootis** (Σ 1877), one of the most beautiful of the double stars. The primary is 2.5 mag., and yellow, the companion 6 mag., and blue. Distance 2.9″. The colours are very decided, and their contrast has a pretty effect.
$14^h\ 44^m$	— 15° 33′	α **Librae**, 2.5 mag., with a companion 5 mag., distance 230″.
$14^h\ 46^m$	+ 19° 36′	ξ **Bootis** (Σ 1888), 4.5 mag., and yellowish, with a red companion 6.5 mag. The distance of this latter is rapidly decreasing. In 1882 it was 3.9″, while in 1829 it was, according to Struve 7.2″. The position angle is also rapidly changing. The period of revolution seems to be 130 years.
$14^h\ 46^m$	+ 49° 12′	39, **Bootis** (Σ 1890), a double star 6 and 6.5 mag., distance 3.6″. The primary is white, the companion reddish.
$14^h\ 50^m$	— 20° 52′	**Anonyma in Libra**, a remarkable multiple star. The primary is 6 mag., one companion (*B*), 7.5 mag. The rest are all very faint. Burnham (1878), gives the following measurements :— A B d = 15.1″ p = 290° A E d = 69.4″ p = 52.5°. A C d = 120.6″ p = 322° A D d = 52.5″ p = 171.0° A F d = 105.5″ p = 166.5°. The primary and the more brilliant companion compose a system with very decided proper motion. The other stars do not really, but only appear to, belong to it.
$14^h\ 55^m$	— 8° 2′	δ **Librae**, variable and belongs to the Algol type. Schmidt recognised its variability in 1859. Period 2 days $7^h\ 21.3^m$. The changes of brilliancy only occupy 12 hours. At maximum the star is 5, at minimum 6 mag.
$14^h\ 56^m$	+ 54° 23′	4029, **Nebula in Draco**, irregular, faint but large. Discovered by W. Herschel, 5 May, 1788.
$15^h\ 0^m$	+ 48° 8′	44, **Bootis** (Σ 1909), a yellowish star 5 mag., with a blueish companion 6 mag., distance 5″. Both primary and companion seem to be variable to a slight degree. [Said to be a mutually occulting pair, with a period of 261 years.]
$15^h\ 5^m$	— 19° 20′	ι **Librae**, a star 4.5 mag., with a companion 9 mag., d=57″, p=110°. Burnham found the companion itself to be double, consisting of two stars of 10 mag., distance 1.9″.
$15^h\ 7^m$	+ 19° 44′	Σ 1919, **Bootis**, 6.5 mag., and somewhat yellowish, with a white companion 7 mag., distance 25″.
$15^h\ 10^m$	+ 38° 43′	Σ 1926, **Bootis**, 6.5 mag., with a faint companion 9 mag., d=1.4″, p = 259°. A difficult double star.
$15^h\ 11^m$	+ 33° 46′	δ **Bootis**, 3 mag., and white. At distance 105″, is a companion 7.5 mag., whose position has not changed for 50 years.

Right Ascension 1880.	Declination 1880.	
$15^h\ 12^m$	$+\ 2°\ 31'$	4083, **Star Cluster in Serpens.** Observed by Messier in 1764, and described as a beautiful, circular nebula 3′ in diameter. Messier says, "In clear weather it can be seen very well with an ordinary telescope of 1′ focus." Kirch, in 1702, was the first to discover this nebula. Messier could find in it no trace of stars. Nevertheless, an average telescope shows that it is a cluster of stars and no nebula. Herschel, with his 40-foot reflector, could distinguish over 200 stars, though towards the centre they were so densely placed that it was impossible to resolve them. Rosse says the cluster is 7′ to 8′ in diameter, the stars ranging from 12 to 15 mag.
$15^h\ 13^m$	$+\ 2°\ 13$	5, **Serpentis** (Σ 1930). 5 mag., with a faint companion 10 mag., $d = 10.6''$, $p = 40.8°$, the position of which does not seem to alter. Struve, in 1836, believed the primary to be itself double, but this view has not been since corroborated.
$15^h\ 13^m$	$+\ 10°\ 49'$	Σ 1931, **Serpentis.** 6.5 mag., with a companion 7.5 mag., $d = 13.5''$, $p = 173°$. No change of position has been noticed in last 50 years.
$15^h\ 13^m$	$+\ 27°\ 17'$	Σ 1932, **Coronae.** The primary is 5.5 mag., and has a companion 6 mag.; both white. Distance, according to Engelmann, 1883, 1.2″, position angle 308°.
$15^h\ 13^m$	$+\ 32°\ 5'$	*U* **Coronae.** A variable star of the Algol type, recognised by Winnecke in 1863. At maximum 7.6 mag., at minimum 8.8 mag. Period 3 days $10^h\ 51.2^m$. The decrease in brilliancy occupies 4.5^h, the increase 5.2^h. The brilliancy at maximum varies somewhat.
$15^h\ 14^m$	$-\ 19°\ 57'$	*S* **Librae**, variable, slightly reddish in colour, at maximum only 8 mag., at minimum under 12 mag. The changes of brilliancy are very irregular. Discovered by Borrelly in 1872.
$15^h\ 16^m$	$+\ 14°\ 45'$	*S* **Serpentis.** A reddish star, noted by Lalande in 1794 as of 8 mag., but which could no longer be found by Harding in 1807. Its variability was not recognised till 1828. At maximum it is 7—8 mag., at minimum under 12 mag. Period 361 days.
$15^h\ 17^m$	$+\ 31°\ 48'$	*S* **Coronae**, of a reddish-yellow, recognised as variable by Hencke in 1860. Maximum 8, minimum 12 mag. Period 361 days.
$15^h\ 18^m$	$+\ 30°\ 43'$	π **Coronae** (Σ 1937). A yellow star of 5.2 mag., with a golden coloured companion 5.7 mag; it is extremely close to the primary, the distance (Engelmann, 1884) being only 0.6″.
$15^h\ 20^m$	$+\ 37°\ 48'$	μ **Bootis.** A yellow-greenish star 4 mag., with a companion (μ^2) 7 mag., distance 108″, position angle 172°. This latter is itself double, but, at present, can be divided only with a very powerful telescope.
$15^h\ 29^m$	$+\ 10°\ 57'$	δ **Serpentis** (Σ 1954), yellowish, 3.5 mag., with a companion 4 mag., $d = 3.5''$, $p = 190°$.
$15^h\ 32^m$	$-\ 8°\ 24$	Σ 1962, **Librae**, two stars 6 mag., distance 12″.

Right Ascension 1880.	Declination 1880.	
$15^h\ 34^m$	$+\ 36°\ 38'$	Σ 1964, **Coronae.** A star of 7 mag., with a companion 7.5 mag., distance 15.5″. Burnham found that this companion was itself double, distance 1.3″.
$15^h\ 35^m$	$+\ 37°\ 2'$	ζ **Coronae** (Σ 1965), 4 mag., with a companion 5 mag., distance 7″.
$15^h\ 36^m$	$+\ 80°\ 50'$	π^1 **Ursae Minoris** (Σ 1972), 6 mag., yellowish, with a yellowish companion 7 mag., d = 30″, p = 83°.
$15^h\ 37^m$	$+\ 26°\ 41'$	γ **Coronae** (Σ 1967). A greenish-white star 4 mag., with a reddish companion 7 mag., distance (when discovered by Struve in 1826), 0.7″. In the following year it could no longer be divided, and it was not seen again until the end of the fiftieth year, and then only with great difficulty. Even Burnham, in 1880, found the primary star only, and apparently quite round. Engelmann, however, in 1883-84, occasionally saw it as clearly elongated. [This is a mutually occulting pair, with a period of ninety-five years.]
$15^h\ 38^m$	$+\ 6°\ 48'$	α **Serpentis,** a star of 2.5 mag., with a beautiful spectrum (Vogel, Class IIa). There is a star of 12 mag., at distance 59″, position angle 353°.
$15^h\ 41^m$	$+\ 15°\ 48'$	β **Serpentis** (Σ 1970), 3.5 mag., and somewhat blueish. There is a companion of 9 mag., d = 30.6″, p = 265°.
$15^h\ 44^m$	$+\ 28°\ 32'$	*R* **Coronae,** a red star, recognised as variable by Pigott, in 1785. The changes of brilliancy are very irregular, and often imperceptible for years together. At maximum it is 5.8 mag., at minimum it is invisible even with a most powerful telescope.
$15^h\ 45^m$	$+\ 15°\ 30'$	*R* **Serpentis,** yellowish-red, recognised as variable by Harding, in 1826. At maximum it is 5.6, at minimum less than 11 mag. The changes of brilliancy are irregular. Period nearly 358 days.
$15^h\ 48^m$	$+\ 53°\ 16'$	Σ 1984, **Draconis,** a star of 6.5 mag., with a companion 8.5 mag., d = 6.4″, p = 276°.
$15^h\ 54^m$	$+\ 26°\ 16'$	*T* **Coronae** [Nova] a so-called new star, but which was catalogued at Bonn as a star of 9.5 mag., as far back as 1855. On 12 May, 1866, it was visible to the naked eye, and soon reached the magnitude of α Coronae. On 13 May, its brilliancy already began again to decrease; on 20 May, it could only be seen with a telescope; by the middle of June it was of 9 mag., and has so remained with but slight variations. At the time of its greatest brilliancy, it was rather yellowish, and was described by Baxendell as a yellowish star seen through a blue veil. [From Mr. Roberts' photograph of the region about Nova, taken in 1890, it would seem that six of the stars in D'Arrest's chart of 1864 had disappeared.]
$15^h\ 58^m$	$-\ 11°\ 2'$	ξ **Scorpionis** (Σ 1998). Triple. A star of 5 mag., with two companions 5.5 and 7.5 mag. The nearer companion was in 1883, d = 1.3″, p = 196°, and the distance seems to be increasing. The farther in 1883 was d = 7.1″, p = 66°.
$15^h\ 58^m$	$-\ 19°\ 29'$	β **Scorpionis,** 2 mag., with a companion 6 mag., at distance 13.6″. Burnham, in 1879, divided the primary into two stars of 2 and 10 mag., distance, 97″. A 12-inch refractor is necessary to distinguish this double star.

Right Ascension 1880.	Declination 1880.	
16h 1m	+ 13° 39′	Σ 2007, **Herculis**, a double star, 6.5 mag. and 7.5 mag.; distance 32″.
16h 3m	+ 17° 22′	κ **Herculis** (Σ 2010), a yellowish star with a somewhat reddish companion, 6 mag., distance 30″.
16h 5m	— 19° 9′	ν **Scorpionis**, an easily observed double star, 4 and 7 mag., distance 40.5″; thus observed by both Herschel and South. Mitchell, however, at Cincinnati in 1846, found that the companion is itself double, and consists of 2 stars of 6.5 mag. at distance 1.8″. Lastly Burnham in 1874 divided the primary also into two stars, but the distance is only 0.8″.
16h 8m	+ 13° 51′	49 **Serpentis** (Σ 2021). Primary 6.5 mag., companion 6.7 mag., distance 3.7″.
16h 10m	+ 34° 10′	σ **Coronae** (Σ 2032), 5 mag., yellowish with a blueish companion, 6 mag., distance 3.7″. There is also a star 10 mag., d = 54″, p = 88°, besides a faint star, d = 4.9′, p = 48.9°.
16h 10m	— 22° 41′	4173, **Star Cluster in Scorpio**, discovered by Messier in 1781, and described as a circular nebula, 2′ in diameter, with brilliant centre, like the nucleus of a comet. Later on Herschel, with the aid of his great telescope, found that the object was in reality a star cluster, the stars in which are exceedingly dense. On 21 May, 1860, Auwers saw a star of 6.5 mag. in the cluster which had not been visible there before, and this observation was confirmed a few days later by Pogson. The star was already decreasing, and by the middle of June, 1860, was no longer visible. Near it are two variable stars *R* and *S*. The former, discovered by Chacornac in 1853, is faint at maximum, being only 9 mag., and at minimum is almost under 13 mag. The change of brilliancy occupies 223 days. The latter (*S*) varies between 9 and 13 mag. Period only 177 days. Neither star is of any particular colour.
16h 12m	+ 29° 29′	υ **Coronae.** A star of 5.5 mag., with a companion of 9 mag., and three other very faint companions. Burnham gives (1879) the following measurements: A B d 86.3″ p 22.4″ A 6 mag. B 10 mag. A C 123.6″ 52.3° C 9 „ B D 13.2″ 222.7° D 13 „ A a 56.1″ 29.5° a 12 „
16h 14m	— 25° 18′	σ **Scorpionis.** 3.5 mag., with a companion 8.5 mag.; d = 20.4″, p = 273°.
16h 16m	— 26° 14′	4183, **Nebula in Scorpio.** A dense cluster of very small stars, almost on the parallel of Antares, and 1½ degrees to the west of it. Observed by Lacaille, and included in his list; Messier saw the cluster in 1764, and remarks that it is 2½ minutes in diameter, and looks like a patch of nebula in a telescope of low power. W. Herschel (in 1783) resolved the whole into stars with a 10-foot reflector.

Right Ascension 1880.	Declination 1880.	
$16^h\ 17^m$	$+\ 19°\ 26'$	γ **Herculis**, 3.5 mag., with a companion 8 mag., distance 38″.
$16^h\ 18^m$	$-\ 23°\ 10'$	ϱ **Ophiuchi**, a star of 5 mag., which is apparently to a slight degree variable, with a companion 7.5 mag., d = 3.7″, p = 358°.
$16^h\ 20^m$	$+\ 19°\ 10'$	*U* **Herculis**, recognised as variable by Hencke in 1860. At maximum it sometimes reaches 6.5 mag., at minimum it is under 11 mag. Period nearly 408 days.
$16^h\ 22^m$	$-\ 26°\ 10'$	α **Scorpionis (Antares)**, a brilliant star 1 mag., with a companion 7.5 mag., d = 3″, p = 274°. The companion was discovered simultaneously at Rome and Cincinnati in 1849. Bürg at Vienna, 13 April, 1819, when Antares was eclipsed by the moon, and when Antares should have come from behind the moon's disk, saw a star of 6.5 mag., which, 5 seconds later, seemed suddenly to attain the same brilliancy as Antares. He at once came to the conclusion that Antares was a double star. [Its spectrum belongs to Group II.]
$16^h\ 22^m$	$+\ 61°\ 58'$	99, **Draconis** (Σ 2054), 5.5 mag., with a companion 7 mag., distance only 1″.
$16^h\ 22^m$	$+\ 61°\ 47'$	η **Draconis**, a star of 2.8 mag., yellow, with a faint companion 10 mag., d = 4.8″, p = 144°. Burnham has seen several other very minute stars in the vicinity.
$16^h\ 25^m$	$+\ 42°\ 9'$	30, *g* **Herculis**, recognised as variable by Baxendell in 1857. The changes of brilliancy are very irregular. At maximum the star is 5, and at minimum 6 mag.
$16^h\ 25^m$	$+\ 2°\ 15'$	λ **Ophiuchi** (Σ 2055). A yellowish star of 4 mag., with a blueish companion 5.5 mag. The distance, which is increasing, was in 1884: 1·6″, position angle, 43°.
$16^h\ 26^m$	$-\ 12°\ 47'$	4211, **Star Cluster in Ophiuchus.** An extensive cluster of small stars. Discovered by W. Herschel on 12 May, 1793, and described as a very beautiful, rich, and dense cluster, 5′ to 6′ in diameter, in which the stars are collected with gradually increasing density towards the centre. Five brilliant stars are to be seen round the cluster.
$16^h\ 33^m$	$+\ 53°\ 10'$	16, 17, **Draconis** (Σ 2078), appears, to the naked eye, like a star of 4.5 mag., in reality 2 brilliant stars of 5 mag., at distance 90″. The one which follows is double, having a companion 6 mag., at distance 3.7″.
$16^h\ 35^m$	$+\ 4°\ 26'$	*m* **Herculis** appears, to the naked eye, like a star of 6 mag. In reality it is two stars of 6 mag., at distance 69″.
$16^h\ 35^m$	$+\ 49°\ 10'$	42, **Herculis** (Σ 2082), a star of 5 mag., with a faint companion 11 mag., d = 22.4″, p = 92°.
$16^h\ 37^m$	$+\ 31°\ 49'$	ζ **Herculis** (Σ 2084), a brilliant white star of 2.6 mag., with a companion 6.5 mag., d = 1.4″, p = 114° (1880). W. Herschel discovered the companion in July, 1782, but, later on, could no longer see it. It was next observed in 1826 with the Dorpat refractor. The companion's period of revolution seems to be only 36 years.

Right Ascension 1880.	Declination 1880.	
$16^h\ 37^m$	$+\ 36°\ 41'$	4230, **Star Cluster in Hercules.** A magnificent cluster visible on a clear night, with the naked eye, as a light cloud, as remarked by Halley, who discovered it in 1714. Messier observed this object in 1764, and says, that it can be seen with a 1-foot telescope as a starless nebula, brilliant, circular, brighter at the centre. Its diameter is estimated by Messier to be 6′, and the same astronomer remarks that the nebula is situated near two stars of 8 mag., of which one is above, the other beneath it. A 4-inch refractor will resolve the nebula into stars, and Secchi, with his 9-inch refractor, found the stars to be distributed over a space 8′ in diameter. Their number is probably 5,000 to 6,000, and Rosse has noticed a remarkable spiral grouping among them. [The great 36-in. refractor of the Lick Observatory has thoroughly resolved the central glow of nebulosity into separate points.—Ed.]
$16^h\ 39^m$	$+\ 24°\ 1'$	4234, **Nebula in Hercules.** A blueish, planetary nebula, circular, 8′ in diameter, and ill-defined at the edges. Its spectrum shows the nebula to be composed of incandescent gas, being characterised by the three bright lines, of which the first is the most brilliant. Elsewhere the spectrum is dull and continuous. Webb describes the appearance of this nebula by saying that it looks like a star which has not been properly focussed in the telescope.
$16^h\ 41^m$	$-\ 1°\ 43'$	4238, **Star Cluster in Ophiuchus.** Discovered by Messier in 1769, and described as a faint, circular, starless nebula, 3′ in diameter, near which there is a star of 9 mag. In 1783, Herschel's reflector resolved the nebula into stars showing a cluster of 7′ to 8′ in diameter, at the centre of which the stars are very densely collected.
$16^h\ 41^m$	$+\ 2°\ 17'$	19, **Ophiuchi** (Σ 2096), 6 mag., with a companion 9 mag., d = 22.2″, p = 93°.
$16^h\ 41^m$	$+\ 35°\ 52'$	Σ 2101, **Herculis**, a star of 6 mag.,with a companion 9 mag., d = 4.2″, p = 57°.
$16^h\ 44^m$	$+\ 47°\ 44'$	4244, **Nebula in Hercules**, a large, round but faint, planetary nebula, discovered by W. Herschel 12 May, 1787. It forms a triangle with two stars of 6 mag.
$16^h\ 44^m$	$+\ 36°\ 8'$	Σ 2104, **Herculis**, a pretty, double star, 6.5 and 8.5 mag., distance 6″.
$16^h\ 46^m$	$+\ 15°\ 9'$	*S* **Herculis**, of a clear red colour and variable, discovered at Bonn in 1856. At maximum it is 6 mag., sometimes only 7 mag., at minimum it decreases to 11.5 and 12 mag. Period 303 days.
$16^h\ 51^m$	$-\ 3°\ 54'$	4256, **Star Cluster in Ophiuchus.** Discovered by Messier, 29 May, 1763, and described as a faint, circular, starless nebula, which cannot be discerned without difficulty with a 3-foot telescope. W. Herschel was the first to resolve this nebula into a densely crowded star cluster. These stars are partially visible in a 4-in. refractor.
$16^h\ 53^m$	$-\ 12°\ 42'$	**ova Ophiuchi, 1848.** On 28 April of this year, Hind saw a star 4.5 mag., of a yellowish-red colour in this place where it had never before been visible. The star maintained this brilliancy till 10 May ; it then began to decrease and is now under 12 mag.

Right Ascension 1880.	Declination 1880.	
$16^h\ 54^m$	$-29°\ 56'$	4261, **Star Cluster in Scorpio.** A beautiful nebula, discovered by Messier, 7 June, 1771, and described by him as like a comet. The nebula was resolved into stars by W. Herschel, with his 20-foot telescope. It is beyond the reach of ordinary refractors.
$16^h\ 56^m$	$-26°\ 5'$	4264, **Star Cluster in Ophiuchus,** discovered by Messier, 5 June, 1764, catalogued by him as a starless nebula, situated on the parallel of Antares, 3′ in diameter, and of which a good view can be obtained with $3\frac{1}{2}$-foot telescope. W. Herschel, in 1784, proved it to be a globular star cluster.
$16^h\ 58^m$	$-24°\ 36'$	4268, **Star Cluster in Ophiuchus,** discovered by W. Herschel, 2′ to $2\frac{1}{2}'$ in diameter, brilliant and more condensed towards the centre, easily resolved. According to W. Herschel, the stars are of a faint red colour.
$16^h\ 59^m$	$-22°\ 32'$	4269, **Star Cluster in Ophiuchus,** discovered by W. Herschel, 21 May, 1784. It is globular, fairly brilliant, round, somewhat condensed towards the centre, and easily resolved.
$17^h\ 1^m$	$-15°\ 56'$	*R* **Ophiuchi,** reddish, and recognised as variable by Pogson in 1853. At maximum it is not more than 7.5 mag., at minimum it is under 12. Period 302 days.
$17^h\ 3^m$	$+54°\ 38'$	μ **Draconis** (Σ 2130), 4.5 mag., with a companion 5 mag., distance 2.7″.
$17^h\ 3^m$	$-26°\ 25'$	4270, **Star Cluster in Ophiuchus.** A globular cluster, fairly brilliant, large and round, with a sudden increase in brightness towards the centre, can be resolved into stars. It is followed by a faint nebula.
$17^h\ 8^m$	$-26°\ 25'$	36, **Ophiuchi,** 5 mag., and of a golden yellow, with a companion 6 mag., distance 4.7″, position angle 211° (1870).
$17^h\ 9^m$	$+14°\ 32'$	α **Herculis** (Σ 2140), a variable star of a yellowish-red colour, 3 mag., recognised as such by Herschel in 1795. The changes in brilliancy are not very great, but very irregular. At minimum it is over 4 mag. It has a companion 6 mag., distance 4.7″.
$17^h\ 10^m$	$+24°\ 59'$	δ **Herculis** (Σ 3127), 3 mag., of a greenish-white, with a blueish companion 8 mag., distance 19.5″. A beautiful object. [Spectrum of Group IV. type.]
$17^h\ 10^m$	$+1°\ 21'$	*U* **Ophiuchi,** a remarkable variable star, discovered by Sawyer in 1881. It is generally of 6.1 mag., and at minimum decreases to 6.8 mag. The period is only $20^h\ 8^m$, and the change of brilliancy occupies the short space of 4 hours. In this respect it is the most interesting of all the variable stars known at present. The star naturally belongs to the Algol type.
$17^h\ 11^m$	$-24°\ 9'$	39, **Ophiuchi,** 6 mag., with a companion 7.5 mag., distance 11″.
$17^h\ 12^m$	$-18°\ 25'$	4287, **Star Cluster in Ophiuchus,** discerned by Messier, and described as a faint, circular nebula 3′ in diameter. In 1784, Herschel resolved it into stars, with a 20-foot reflector.
$17^h\ 13^m$	$+43°\ 16'$	4294, **Star Cluster in Hercules.** Described by Messier as a starless nebula, with a brilliant centre, easily discerned with a small telescope. A refractor of moderate power will resolve the nebula into stars which are distributed over an area 8′ in diameter. The centre could not be resolved even in Rosse's telescope.

Right Ascension 1880.	Declination 1880.	
$17^h\ 13^m$	$+\ 33°\ 14'$	68 *u* **Hercules**, a variable star, varying from 4.5 to 5 mag., and red in colour. The period, according to Schmidt, who discovered it, is very irregular.
$17^h\ 14^m$	$-\ 12°\ 43'$	*v*, **Serpentis**, 4 mag. There is a star of 8 mag., d = 48″, p = 32°.
$17^h\ 17^m$	$-\ 17°\ 42'$	4296, **Nebula in Ophiuchus.** A brilliant nebula, discovered by W. Herschel, 17 June, 1784. It is of considerable size, brighter towards the centre, and can be resolved into numerous very small stars with a powerful telescope.
$17^h\ 20^m$	$+\ 37°\ 16'$	*ε* **Herculis** (Σ 2161), a greenish-white star, 4 mag., with a companion (also somewhat green), 5.5 mag., distance 36″.
$17^h\ 22^m$	$+\ 11°\ 29'$	Σ 2166, **Ophiuchi**, 6 mag., with a companion 7.5 mag., distance 2.7″.
$17^h\ 22^m$	$-\ 23°\ 39'$	4302, **Nebula in Ophiuchus**, annular, faint and small.
$17^h\ 23^m$	$-\ 21°\ 23'$	**Nova in Ophiuchus, 1604.** At this point there appeared, in October, 1604, a star of 1 mag., with a sparkling light second to Venus only in brilliancy. It remained till the spring of 1606, continually decreasing, and then vanished entirely.
$17^h\ 24^m$	$-\ 0°\ 57'$	Σ 2173, **Ophiuchi**, a star of 5.7 mag., golden-yellow in colour, with a companion which is very close to its primary. The distance as estimated by Schiaparelli, in 1882, is only 0.3″. [Said to be a mutually occulting pair, revolving in forty-five years.]
$17^h\ 29^m$	$+\ 9°\ 40'$	53 *f*, **Ophiuchi**, a star of 6 mag., recognised as double by Herschel in 1781. The companion is 7.5 mag., and apparently does not change its position. Distance 41″, position angle 191°.
$17^h\ 29^m$	$+\ 13°\ 15'$	54, **Ophiuchi** (Σ 2184), 6.5 mag., with a very faint companion d = 21.4″, p = 77°.
$17^h\ 30^m$	$+\ 55°\ 16'$	*ν* **Draconis**, two stars of 5 mag., visible to the naked eye as a star of 4 mag. Distance 62″.
$17^h\ 31^m$	$-\ 3°\ 10'$	4315, **Star Cluster in Ophiuchus.** A globular cluster, 7′ in diameter, easily seen as a circular nebula. Messier discovered it in 1764, and described it as a starless nebula, not large, faint, standing near a small star of 9 mag., easily seen with an ordinary $3\frac{1}{2}$-foot telescope. W. Herschel resolved the nebula into stars with his 20-foot reflector. With a 4-inch refractor, evidence of its resolvability is apparent. It is surrounded on three sides by several brilliant stars.
$17^h\ 31^m$	$+\ 21°\ 4'$	Σ 2190, **Herculis**, 6 mag., with a companion 8.5 mag., d = 10″, p = 24°.
$17^h\ 35^m$	$+\ 75°\ 48'$	4321, **Nebula in Ursa Minor**, 3′ in extent, brighter towards the centre. W. Herschel, who discovered it, took it to be a star cluster at an immeasurable distance.
$17^h\ 36^m$	$+\ 24°\ 34'$	83, **Herculis** (Σ 2194), 6.5 mag., with a companion 8 mag., at distance 16.3″. The distance seems to be slowly increasing.
$17^h\ 39^m$	$+\ 2°\ 37'$	61, **Ophiuchi** (Σ 2202), a double star, 6 and 6.5 mag., d = 20″, p = 93°. No change of position has been observed since Herschel's time.

Right Ascension 1880.	Declination 1880.	
$17^h\ 40^m$	$-27°\ 47'$	X **Sagittarii**, recognised as variable by J. Schmidt, in 1866. The star varies between 4 and 6 mag., within a period of 7 days.
$17^h\ 42^m$	$+17°\ 46'$	Σ 2215, **Herculis**, 6.5 mag., with a companion 8 mag., distance only 0.7″, angle 301°. (1878.)
$17^h\ 42^m$	$+27°\ 48'$	μ **Herculis** (Σ 2220), 3.5 mag. and yellowish, with a companion 9.5 mag., d = 31″, p = 244°. In 1856 Clark discovered that the companion itself is double, consisting of 2 stars of 11 mag., which were then at distance 1.8″. This distance has since steadily decreased, and is now only about 0.5″. A very difficult object.
$17^h\ 44^m$	$+72°\ 12'$	ψ **Draconis** (Σ 2241), a star of 4.5 mag., with a companion 5 mag., distance 31″. Recognised as double by Flamsteed.
$17^h\ 47^m$	$+23°\ 6'$	4343, **Nebula in Hercules**, small, round, rather brighter towards the centre, with a small nucleus.
$17^h\ 50^m$	$-19°\ 0'$	4346, **Star Cluster in Ophiuchus.** A beautiful cluster discovered by Messier, 20 June, 1764. Its diameter is 15′, and in this space there are nearly 80 stars of 9 to 12 mag. The stars seem to be scattered over the whole field of vision, the lowest magnifying power must, therefore, be used.
$17^h\ 54^m$	$+51°\ 30'$	γ **Draconis**, 2.5 mag., with a very faint companion 11 mag., d = 125″, p = 116°. Burnham saw, besides, an exceedingly faint star, 13.5 mag., d = 21″, p = 152°.
$17^h\ 55^m$	$+2°\ 56'$	67, **Ophiuchi.** This star 4 mag. has, at distance 55″, a red companion 8 mag. The contrast of colour in these stars is pretty.
$17^h\ 56^m$	$-23°\ 2'$	4355, **Nebula in Sagittarius.** A group containing several nebulæ. Erroneously described by Messier as a star cluster. In 1874, Herschel saw 3 nebulæ, with a double star in their midst. J. Herschel found this star to be triple. Either the star or the nebulæ seems to rapidly change its position.
$17^h\ 56^m$	$-30°\ 2'$	4359, **Star Cluster in Sagittarius,** globular, fairly brilliant, condensed towards the centre. The stars are exceedingly small.
$17^h\ 57^m$	$+21°\ 35'$	95, **Herculis** (Σ 2264), 5 mag., somewhat greenish, with a companion 5.5 mag., distance 6″. [Concerted changes of colour are recorded of these.]
$17^h\ 57^m$	$-24°\ 23'$	4361, **Star Cluster in Sagittar s,** a very beautiful object discovered by Messier in 1764, and described by him as a star cluster. It really consists of several nebulæ, with a triple star and numerous others near to it.
$17^h\ 57^m$	$-8°\ 10'$	τ **Ophiuchi** (Σ 2262), 5 mag., with a blueish companion 9 mag., d = 100″, p = 127°. The primary, as discovered by W. Herschel, is itself a double star. Schiaparelli in 1882 found d = 1.9″, p = 252°. The period of revolution is nearly 200 years.
$17^h\ 58^m$	$-22°\ 31'$	4367, **Star Cluster in Sagittarius,** discovered by Messier in 1764, and a beautiful object. The stars are of 8 mag. and under. Messier says they are mingled with nebulæ.

Right Ascension 1880.	Declination 1880.	
$17^h\ 57^m$	$-29°\ 35'$	*W* **Sagittarii**, recognised as variable by J. Schmidt in 1866. At maximum it is 5, at minimum 6.5 mag. The period seems to be from 7 to 8 days.
$17^h\ 59^m$	$+66°\ 38'$	4373, **Nebula in Draco.** Discovered by Herschel, 15 Feb., 1786. He describes it as a planetary nebula of great brilliancy, disk 35″ in diameter, one angle very ill-defined. A long and careful examination reveals a brilliant, well-defined centre, round in shape. The nebula can be seen very well with a $3\frac{1}{2}$-inch refractor. It gives a beautiful spectrum of bright lines. Huggins found the 3rd line the faintest. Vogel, on the other hand, declares it to be quite as brilliant as the second. [The Lick refractor has shewn that this nebula has a helical form.]
$17^h\ 59^m$	$+2°\ 33'$	70, **Ophiuchi** (Σ 2272), 4 mag., and yellow, with a red companion, 6 mag. distance (Schiaparelli, 1882), 2.3″. Since Herschel's time, this companion has completed more than a full revolution round the primary. Period of revolution, 95 years [Mr. Gore makes it 88 years]. The parallax is 0.16″, the distance from the earth = 1,300,000 radii of the earth's orbit. The mean distance of the companion from its primary is 4,300 million kilometers, or nearly 30 radii of the earth's orbit [said recently to range from 14 to 42 radii], and the whole mass of the system is equal to about three times that of our sun.
$18^h\ 0^m$	$+48°\ 29'$	Σ 2277, **Herculis**, 6 mag., with a companion 8 mag., at distance 27″.
$18^h\ 0^m$	$-23°\ 14'$	4376, **Star Cluster in Sagittarius**, large and fairly rich.
$18^h\ 3^m$	$+26°\ 5'$	100, **Herculis** (Σ 2280), two stars 6 mag., distance 14″.
$18^h\ 4^m$	$+3°\ 58'$	73, **Ophiuchi** (Σ 2281), a difficult double star 6 and 7.5 mag. The distance seems to have decreased since Struve observed it. In 1876 it was only 1″.
$18^h\ 5^m$	$+31°\ 0'$	*T* **Herculis**, a variable star, discovered at Bonn in 1857. Its brilliancy ranges from 7 to 12 mag. It is of a deep red colour. Period 165 days.
$18^h\ 5^m$	$+16°\ 27'$	Σ 2289, **Herculis**, a star of 6 mag., with a companion 7 mag. Distance, only 1.2″.
$18^h\ 6^m$	$-21°\ 36'$	4388, **Star Cluster in Sagittarius**, a fairly large and scattered cluster of stars, ranging from 9.5 to 11 mag.
$18^h\ 6^m$	$+6°\ 49'$	4390, **Nebula in Ophiuchus**, fairly brilliant, planetary. Its spectrum contains the three early recognised bright lines, of which the first is the most brilliant, the last (falling on *F*), the faintest. [Spectrum consists of the three chief nebula lines, and a faint continuous spectrum.—Huggins.]
$18^h\ 7^m$	$-21°\ 5'$	μ **Sagitarii**, a quintuple star, primary 3.5 mag., and yellowish, has a companion 10 mag., d = 25″, p = 119°; another 10 mag., d = 50″ p = 115°. The other two companions seen by Burnham, are merely faint points of light.
$18^h\ 9^m$	$+79°\ 59'$	40, 41, **Draconis** (Σ 2308). Seen with the naked eye, these look like a star of 5 mag. They are really two stars 5.2 and 6 mag., distance 20″.
$18^h\ 11^m$	$-18°\ 28'$	4397, **Star Cluster in Sagittarius.** A rich star cluster, discovered by Messier, 20 June, 1764. Nearly $1\frac{1}{2}°$ in diameter. Visible to the naked eye as an offshoot of the Milky Way.

Right Ascension 1880.	Declination 1880.	
$18^h\ 12^m$	$-13°\ 50'$	4400, **Star Cluster in Scutum Sobieski.** A cluster of small stars discovered by Messier on 3 June, 1764. It is 8′ in diameter, and in the Finder looks like a faint nebula.
$18^h\ 13^m$	$-17°\ 12'$	4401, **Star Cluster in Sagittarius.** Discovered by Messier at the same time as the cluster just mentioned, and described as less brilliant than it. Messier says that it looks like a nebula when seen with an ordinary 3½-foot telescope, while with a powerful instrument stars only are visible. Diameter 5′. Contains a double star 8.5 and 10.5 mag., distance 25″.
$18^h\ 14^m$	$-16°\ 15'$	4403, **Nebula in Sagittarius.** Something like a horse-shoe in shape. Discovered by Messier 3 June, 1764. He describes it as a luminous, starless streak, 5′ to 6′ in length, spindle-shaped, not unlike the nebula in Andromeda, but very faint. There are two stars near it, parallel with the equator, but visible only in a telescope. In clear weather a very good view of this nebula may be obtained with an ordinary 3½-foot telescope. W. Herschel was the first to get a perfect view of it. According to Holden, one arm of this nebula has changed its position. The spectroscope shows the nebula to be a mass of incandescent gas.
$18^h\ 17^m$	$-24°\ 56'$	4406, **Star Cluster in Sagittarius.** A densely crowded cluster of very minute stars. Seen by Messier, 27 July, 1764, and described as a starless, circular nebula, not easy to distinguish with a 3½-foot telescope. Diameter 2′. A powerful instrument is required to divide it.
$18^h\ 18^m$	$-20°\ 36'$	21, **Sagittarii.** A star of 5 mag., which has, at distance 2″, a faint companion 8 mag., discovered by Alvan Clark.
$18^h\ 21^m$	$+\ 0°\ 7'$	59 *d*, **Serpentis** (Σ 2316), 6 mag., yellowish, with a companion 7.5 mag., d = 3.9″, p = 314°.
$18^h\ 22^m$	$+\ 6°\ 29'$	4410, **Star Cluster in Ophiuchus,** large, coarsely scattered, discovered by Caroline Herschel in 1783.
$18^h\ 22^m$	$+\ 58°\ 44'$	39 *b*, **Draconis** (Σ 2323), 5 mag., with a companion 8 mag., d = 3.1″, p = 2.3°. Also another 7 mag., d = 90″, p = 22°.
$18^h\ 23^m$	$+\ 74°\ 29'$	4415 (Dr. Dreyer's G.C. 6643), **Nebula in Draco.** A remarkable nebula, fairly large and brilliant, preceded by two stars. According to Tuttle it is variable in brilliancy. D'Arrest, in writing on this subject to J. Herschel, 8 May, 1863, says that Tuttle's nebula was so brilliant and remarkable in the Finder (2 min. long and 80″ broad) that he was convinced it had increased in brilliance since J. Herschel and his father observed it.
$18^h\ 23^m$	$+\ 71°\ 16'$	φ **Draconis,** 5 mag., with a companion 6.5 mag., distance only 0.6″. The companion can only be seen by a powerful telescope.
$18^h\ 25^m$	$-19°\ 13'$	*U* **Sagittarii,** a variable star, discovered by J. Schmidt in 1866. At maximum it is 7 mag., at minimum 8.5 mag. Period nearly 7 days.
$18^h\ 25^m$	$-19°\ 10'$	*M* 25, **Star Cluster in Sagittarius.** A cluster of small stars, discovered by Messier 20 June, 1764. Can be seen with quite a small telescope. Burnham has measured several double stars in it.

Right Ascension 1880.	Declination 1880.	
$18^h\ 29^m$	$-24°\ 0'$	4424, **Star Cluster in Sagittarius**, discovered by Abraham Ihle, 1665. Messier could not distinguish any star in it, catalogued it as circular and easily seen with a common telescope of $3\frac{1}{2}'$ focus. It is surrounded by 5 irregularly placed stars. Herschel's 10-foot telescope resolved the nebula into a star cluster. Towards the middle the stars are denser; diameter 8′.
$18^h\ 30^m$	$-\ 8°\ 19'$	4426, **Star Cluster in Scutum Sobieski,** large, fairly rich, and of moderate density. Discovered by W. Herschel, 16 June, 1784.
$18^h\ 33^m$	$+\ 38°\ 40'$	α **Lyrae** (Vega). This splendid star, 1 mag., has near it several faint stars, but their connection with it is merely optical. One of them, which was used by Struve and Brünnow as a comparison star for calculating the parallax of Vega, is of 9.5 mag., d = 48″, p = 156°, another of 9 mag., d = 150″, p = 40°. Winnecke and Burnham have also measured a very faint star (13 mag.), d = 52″, p = 292°. [In Nov., 1890, Mr. A. Fowler exhibited to the R.A. Society photographs of the spectrum of Vega which indicate that it is a spectroscopic double of the β Aurigæ and ϱ Ursae Majoris type. The principal lines are due to Hydrogen. The separation of the K line, within a few hours, indicated a circular orbit, and a period of revolution of about 24.68 hours. This duplication of the K line has not (1891) been confirmed by photographs taken by Pickering, Vogel and the Messrs. Henri.]
$18^h\ 35^m$	$-\ 4°\ 52'$	4429, **Star Cluster in Scutum Sobieski,** large and rich, but the stars are little more than minute luminous points.
$18^h\ 39^m$	$-\ 9°\ 31'$	4432, **Star Cluster in Scutum Sobieski.** Discovered by Messier, 2′ in diameter.
$18^h\ 40^m$	$-\ 1°\ 5'$	5, **Aquilae,** (Σ 2379), 6 mag., with a blueish companion 7.4 mag., distance 13.2″. There is also a second companion 11 mag., d = 27.3″, p = 145°.
$18^h\ 40^m$	$+\ 39°\ 33'$	ε and 5 **Lyrae.** A very interesting pair of double stars, first observed by Flamsteed, though with keen sight and under specially favourable circumstances ε and 5 Lyrae can be seen as clearly separated. The distance, according to Auwers, 1682, is 208″. The fact that each of these stars is itself double was verified by Christian Mayer, and in 1823 John Herschel discovered three other very faint stars between ε and 5 Lyrae. The distance of the two components from ε is, according to Dembowski, 1863, 3.045″. The distance of both stars from 5 Lyrae was in the same year 2.48″, and seems to be slowly decreasing. [From their common proper motion, these seem to constitute a physical system of vast dimensions.]
$18^h\ 41^m$	$+\ 37°\ 29'$	ζ **Lyrae,** a star of 4 mag., with a companion 5.5 mag.; distance 44″, recognised by Flamsteed.
$18^h\ 41^m$	$-\ 5°\ 50'$	*R* **Scuti Sobieski.** Recognised as variable by Pigott in 1795. The change of brilliancy is very irregular ; at maximum the star is sometimes 4.5 mag., though it is often under 5.5 mag., at minimum it is 6, sometimes 8 mag. The period is irregular. [The spectra seem, according to the Rev. T. E. Espin, also to vary considerably.]
$18^h\ 41^m$	$+\ 20°\ 26'$	110, **Herculis,** 4 mag., with a companion 11 mag., d = 61″, p = 92°. Burnham saw a still fainter companion, d = 45″, p = 95°.
$18^h\ 43^m$	$+\ 60°\ 56'$	Σ 2403, **Draconis,** 6 mag., with a companion 9 mag. According to Struve, in 1832, d = 1.9″, p = 259°.

Right Ascension 1880.	Declination 1880.	
$18^h\ 45^m$	$-\ 6°\ 25'$	4437, **Star Cluster in Scutum Sobieski.** Discovered by Kirch in 1681, and described later by Messier as a cluster of small stars, only visible with a good instrument. The stars can be clearly seen with a $3\frac{1}{2}$-inch refractor. Lamont and Helmert have taken the measurements of the whole cluster by Trigonometry.
$18^h\ 46^m$	$+33°\ 13'$	β **Lyrae,** a variable star with three companions, a pretty spectacle when seen with the telescope. The primary is yellowish white, at maximum 3.5 mag., at minimum 4.5 mag. The period of the change of brilliancy is 12 days $21^h\ 51^m$, with a double maximum and minimum. [The spectrum of this star consisting of bright lines is periodic in brightness. The variation is most marked, as Gothard shews, in the case of D_3.] Of the companions, the most brilliant is 7.4 mag., d = 45.6, p = 149°; a second, 8 mag., has d = 66″, p = 318°; a third, 8.5 mag., d = 86″, p = 19°. Finally, Burnham has seen a fourth very faint star (11 mag.) d = 46″, p = 248°.
$18^h\ 46^m$	$+10°\ 12'$	4440, **Star Cluster in Aquila,** a beautiful object, consisting of stars 9 to 12 mag. Vogel has measured 62 of them with the micrometer.
$18^h\ 47^m$	$-\ 8°\ 51'$	4441, **Nebula in Scutum Sobieski,** brilliant, large and nearly circular, more condensed towards the centre. According to Herschel it is resolvable into stars.
$18^h\ 48^m$	$-30°\ 37'$	4442, **Nebula in Sagittarius,** discovered by Messier in 1778, and described as a faint nebula with a brilliant centre. According to Herschel it is a globular star cluster consisting of very minute stars.
$18^h\ 49^m$	$+32°\ 53'$	4447, **Nebula in Lyra,** the beautiful and easily-observed Ring nebula. Discovered by Darquier, at Toulouse, 1779, between β and γ Lyrae. He describes it as very delicate, with well-defined boundaries, of about the same size as Jupiter, and looking like a planet that is about to become extinct. Messier describes it as a luminous cluster, apparently composed of small stars. It is, indeed, remarkable that this nebula, which appears like a disk, with a bright border, has a brilliancy wherein one fancies one can see twinkling star-points. Rosse and Bond maintain that they have succeeded in resolving it into separate stars, but its spectrum is one of bright lines which indicate that it is really composed of incandescent gas. A minute star, of 10 mag., follows the nebula closely. [The 36-in. Refractor of the Lick Observatory shows three stars in the central space, where Lord Rosse's drawing gives a blank field. See *Nature*, August 9, 1888. The photographs taken at the Algiers Observatory in 1890 shew that the nebulosity spreads towards the centre, and that the central star there is surrounded by three very feeble stars. Miss Clerke, summing up the evidence as to its form (*Nature*, March 5, 1891), pronounces the nebula elliptical.—Ed.]
$18^h\ 50^m$	$+\ 4°\ 3'$	θ **Serpentis,** a yellowish-white star 4 mag., with a somewhat faint companion at distance 21″.
$18^h\ 50^m$	$+33°\ 49'$	**Multiple Star in Lyra.** The primary, 6 mag., has a companion 6.5 mag., d = 45″, p = 351°. Struve repeatedly observed this double star, but Burnham in 1879 was the first to discover that the primary is itself double, there being near it a small star of 10 mag., d = 1.7″, p = 126°.
$18^h\ 52^m$	$+43°\ 47'$	*R* **Lyrae,** a variable star discovered by Baxendell in 1856, of a reddish colour. The change of brilliancy is but slight, the star varying between 4.3 and 4.6 within a period of 46 days.

Right Ascension 1880.	Declination 1880.	
$18^h\ 54^m$	$+\ 13°\ 28'$	11, **Aquilae**, 5 mag. and greenish white, with a faint companion 9.2 mag., distance 17.4″, position angle, 252°. Discovered by W. Herschel, 25 June, 1781. An optical double star.
$18^h\ 59^m$	$-\ 4°\ 13'$	*h* **Aquilae**, two stars 6 mag., distance 36″, recognised as a double star by Bradley.
$19^h\ 1^m$	$+\ 8°\ 3'$	*R* **Aquilae**, a variable star of a deep red colour. At maximum it is sometimes 6.5 mag., at minimum 11 mag. Period 345 days.
$19^h\ 3^m$	$+\ 32°\ 19'$	17, **Lyrae**, (Σ 2461), a yellowish star 6 mag., with a companion 10 mag., d = 3.7″, p = 324°.
$19^h\ 3^m$	$+\ 4°\ 3'$	4470, **Star Cluster in Aquila**, fairly large, rich, somewhat dense, diameter 12′ to 15′. Discovered by W. Herschel, 30 July, 1785.
$19^h\ 10^m$	$+\ 38°\ 57'$	*η* **Lyrae**, (Σ 2487), a blueish star 4.5 mag., with a companion, d=28″, p = 84°.
$19^h\ 11^m$	$-\ 1°\ 8'$	4482, **Star Cluster in Aquila**, consisting of stars from 9 to 12 mag., discovered by W. Herschel.
$19^h\ 12^m$	$+\ 29°\ 58'$	4485, **Star Cluster in Lyra.** Discovered by Messier 23 January, 1779, as a starless nebula in Lyra. In 1784 Herschel resolved it into stars. It appears dull in a $3\frac{1}{2}$-inch refractor; 4′ to 5′ in diameter.
$19^h\ 12^m$	$+\ 37°\ 55'$	*θ* **Lyrae**, 4.5 mag., with a companion 8.5 mag., d = 101″, p = 70°.
$19^h\ 12^m$	$+\ 0°\ 52'$	23, **Aquilae** (Σ 2492), 6 mag., yellowish, with a faint companion 9.5 mag., d = 3.4″, p = 11°.
$19^h\ 13^m$	$+\ 6°\ 20'$	4487, **Nebula in Aquila**, fairly large, round, of moderate brilliancy. According to Rosse it is of spiral arrangement.
$19^h\ 16^m$	$+\ 18°\ 57'$	Σ 2504, **Vulpeculae**, 6.5 mag., with a companion 8 mag., d = 9″.
$19^h\ 24^m$	$+\ 24°\ 25'$	6 **Vulpeculae**, appearing to the naked eye like a star of 4 mag. In reality 2 stars of 4 and 5 mag., d = 403″.
$19^h\ 26^m$	$+\ 27°\ 42'$	*β* **Cygni**, a reddish yellow star 3 mag., with a blue companion 5 mag., distance 34″. The primary is variable, but the variations of brightness are not important; the colour also varies slightly.
$19^h\ 31^m$	$+\ 16°\ 12'$	*ε* **Sagittae**, 6 mag., with a companion 7.5 mag., d = 92″, p = 81°.
$19^h\ 34^m$	$+\ 49°\ 56'$	*R* **Cygni**, of a deep red colour, at maximum 6 mag., at minimum very faint. Recognised as variable by Pogson in 1852. The period is, at least, 417 days. [Reported Aug. 13, 1888, to have a remarkably bright line (now known to be F) in its spectrum, thus indicating a change in its constitution since Dunér's observations in 1879—80 and 1882.—Edit.]
$19^h\ 34^m$	$-\ 16°\ 34'$	54, **Sagittarii**, 6 mag., with a companion 7.5 mag., d = 45″, p = 42°, and another very faint companion, discovered by Burnham, d = 36″, p = 245°.
$19^h\ 36^m$	$+\ 26°\ 32'$	4508, **Star Cluster in Vulpecula**, very large, fairly rich in stars, not very dense. The stars range from 9.5 to 12 mag.
$19^h\ 37^m$	$+\ 11°\ 32'$	*χ* **Aquilae**, 6 mag., with a companion 7 mag., distance only 0.6″.
$19^h\ 37^m$	$-\ 14°\ 26'$	4510, **Nebula in Sagittarius**, a planetary nebula, discovered by Herschel 8 Aug., 1787. He describes it as small, decidedly nebulous at the edges, and of uniform brightness, 10″ to 15″ in diameter. Several small stars are visible near to it. The spectrum contains 3 bright lines.

Right Ascension 1880.	Declination 1880.	
$19^h\,37^m$	$+\,39°\,55'$	4511, **Star Cluster in Cygnus.** A large and rich cluster, discovered by Harding in 1827. The stars are of 10 to 12 mag.
$19^h\,39^m$	$+\,50°\,15'$	16, **Cygni,** 2 stars of 6 mag., distance 37″.
$19^h\,41^m$	$+\,44°\,50'$	δ **Cygni** (Σ 2579), a greenish star, 3 mag., with a companion 8 mag., first seen by W. Herschel, 1783. Later, the companion could no longer be distinguished, till Struve saw it again in 1826. According to Engelmann, the distance in 1883 was 1.8″, position angle, 321°.
$19^h\,42^m$	$+\,50°\,14'$	4514, **Nebula in Cygnus,** discovered by W. Herschel, 6 Sept., 1773. In small telescopes it looks like a star out of focus. Secchi has made a drawing of this nebula.
$19\;42^m$	$+\,33°\,27'$	17, **Cygni** (Σ 2580),a reddish star 5.6 mag., with a blueish companion 8 mag., distance 26″.
$19^h\,43^m$	$+\,11°\,31'$	π **Aquilae** (Σ 2583),6 mag., with a companion 7 mag., distance, which is at present gradually increasing, 1.6″.
$19^h\,43^m$	$+\,27°\;\;1'$	11, **Vulpeculae.** At this spot there appeared in 1670 a star of 3 mag., which disappeared in the autumn of the same year; in 1671 it re-appeared as a star of 4 mag., but again vanished; was again seen in 1672, and is now completely invisible. In 1852 Hind discovered a small star of 10.5 mag., which in 1861 had diminished to 12 mag., and which he held to be identical with the star of 1670. It seemed to him somewhat blurred as compared with other stars in its vicinity, and this impression was shared by Talmage and Baxendell.
$19^h\,44^m$	$+\,18°\,51'$	ζ **Sagittae** (Σ 2585), a greenish-white star, 5.6 mag., with a companion 9 mag., d = 8.7″, p = 312°. Clark, in 1875, with a 12-inch refractor, found the primary to be itself double. A very difficult object. Burnham's measurements are d = 0.3″, p = 158°.
$19^h\,45^m$	$+\;\;8°\,33'$	α **Aquilae, Altair.** A brilliant star 1 mag., with a beautiful spectrum (Vogel; Class 1a). There is a companion 10 mag., d = 152″, p = 322°. There are several fainter stars nearer to the primary. Burnham saw over a dozen with his great refractor.
$19^h\,46^m$	$+\,32°\,37'$	χ **Cygni,** a variable star of long period, with irregular variations in brightness. Its variability was discovered by Kirch in 1686. At maximum the star reaches 4 mag., at minimum it diminishes to 13 mag. The period is about 400 days.
$19^h\,46^m$	$+\;\;0°\,42'$	η **Aquilae,** recognised as variable by Pigott in 1784. At maximum it is 3.5, at minimum 4.7 mag. The period of 7 days 4^h 14.2^m is at present slowly increasing.
$19^h\,46^m$	$+\,59°\;\;7'$	4517, **Star Cluster in Draco,** a fairly large but not very dense cluster, containing stars of 7 mag.
$19^h\,48^m$	$+\,18°\,29'$	4520, **Star Cluster in Sagitta,** described by Messier as a faint nebula. Herschel resolved it into a dense cluster of stars, 3′ in diameter. A beautiful object.
$19^h\,49^m$	$+\,69°\,58'$	ε **Draconis** (Σ 2603), 5 mag., with a companion 7.6 mag., distance 2.8″.

Right Ascension 1880.	Declination 1880.	
$19^h\ 49^m$	$+\ 6°\ 7'$	β **Aquilae**, a star of 4 mag., pale red in colour, with several faint stars near to it. Burnham gives the following measurements for two of them (1880): A B d = 11.7″ p = 15.7° A C d = 151.7″ p = 347.2° B, according to Engelmann, is 11.4 mag. C is more brilliant.
$19^h\ 49^m$	$-\ 8°\ 32'$	57, **Aquilae** (Σ 2594), 5 mag., with a companion 6 mag., distance 36″. Struve calls both stars white, but at present one star seems to be yellowish, the other gives a greenish light.
$19^h\ 53^m$	$+\ 52°\ 7'$	ψ **Cygni** (Σ 2605), a white star of 5.6 mag., with a companion 7.5 mag., distance 3″.
$19^h\ 54^m$	$+\ 22°\ 23'$	4532, **Nebula in Vulpecula**, Rosse's "Dumb-bell Nebula." First discovered in 1764 and described by Messier as an oval, starless nebula. A 4-inch refractor shows two contiguous nebulæ of moderate brilliancy, surrounded by some stars. The great telescopes of the two Herschels showed no more than this. The best drawing seems to be that of Secchi, who recognised the existence of a multitude of stars between the two nebulæ. According to Huggins these latter give a spectrum of bright lines, and are therefore really masses of incandescent gas. Roberts' photograph in 1888, taken in an exposure of three hours, indicates the completeness of the oval bright border of the disc.
$19^h\ 55^m$	$+\ 17°\ 11'$	13, **Sagittae**, 6 mag., with a companion 7.5 mag., d = 340″, p = 13°. [It gives a banded spectrum. It is probably of mean condensation.]
$19^h\ 57^m$	$+\ 24°\ 36'$	16, **Vulpeculae**, two stars of 6 mag., at distance of only 0.6″ frem one another. They can be resolved in none but the largest telescopes.
$19^h\ 59^m$	$-\ 22°\ 16'$	4543, **Nebula in Sagittarius**, discovered by Méchain in 1780 as a starless nebula. But even Messier recognised stars in it, and W. Herschel, resolved the whole into a star cluster.
$20^h\ 0^m$	$+\ 43°\ 40'$	4544, **Star Cluster in Cygnus**, large, 15′ in diameter, very rich in stars of considerable brilliancy and very dense. Discovered by W. Herschel 11 Sept., 1789.
$20^h\ 2^m$	$+\ 9°\ 3'$	Σ 2628, **Aquilae**, yellowish, 6 mag., with a reddish companion 8.5 mag. d = 4.2″, p = 346°. No motion has been observed in the companion since the time of Struve.
$20^h\ 5^m$	$+\ 20°\ 33'$	θ **Sagittae** (Σ 2637), 6 mag., with a companion 8 mag., d = 11.2″, p = 327°, and a second companion 7.5 mag., d = 76.5″, p = 252°.
$20^h\ 6^m$	$+\ 0°\ 31'$	Σ 2644, **Aquilae**, a double star 6 and 7 mag., d = 3.6″ p = 208°. The primary is of a blueish, white-colour.
$20^h\ 7^m$	$+\ 26°\ 8'$	4559, **Star Cluster in Vulpecula**, a not very dense cluster of moderate brilliancy, fairly rich in stars, some of 6 to 13 mag. Schultz at Upsala has obtained accurate measurements of this cluster.
$20^h\ 9^m$	$-\ 3°\ 52'$	Σ 2654, **Aquilae**, a star of 6.5 mag., with a companion 8 mag., d = 12″, p = 234°.
$20^h\ 10^m$	$+\ 46°\ 23'$	32, o^2, **Cygni**, a star of 5 mag. with a companion 5 mag., d = 338″, p = 323°, and a second companion 7 mag., d = 107″, p = 173°.

Right Ascension 1880.	Declination 1880.	
$20^h\ 11^m$	$-12°\ 55'$	α^2, α^1 **Capricorni**, two stars 3 and 4 mag., both yellowish, distance 376″. Each of them is itself double, α^2 has a companion 10.5 mag., d = 7.4″, p = 150°. This companion again was found to be also double by Clark in 1862, and consists of two stars of 11 mag., distance only 1.2″. They can be divided by the very largest telescopes only. There is a third star (9 mag.), d = 154″, p = 156°. The star α^1 has near it a star of 8.5 mag., d = 44.3″, p = 221°. Burnham found also a small star of 14 mag., d = 40″, p = 182°, but this was only visible in the 26-inch refractor at Washington.
$20^h\ 13^m$	$+37°\ 40'$	*P* **Cygni**, a star of 5.6 mag., which suddenly increased in the year 1600 to 3 mag., disappeared in 1621, but was again seen in 1655 by Cassini as a star of 3 mag.; it then again disappeared. Since 1677 it has been 5.5 mag. without variation. It gives a yellowish light. [Its spectrum is especially interesting, containing as it does bright lines, among them hydrogen lines and D_3.]
$20^h\ 13^m$	$-19°\ 30'$	σ **Capricorni**, a star of 6 mag., with a companion 9 mag., d = 54″. Seen by Herschel.
$20^h\ 13^m$	$+77°\ 21'$	$\varkappa$ **Cephei** (Σ 2675), greenish white, 4 mag., with a companion, 8 mag., d = 7.3″, p = 124°.
$20^h\ 14^m$	$-15°\ 10'$	β **Capricorni**, 3 mag., and of a golden yellow, with a blueish companion 6 mag., distance 205″. Between the two stars, somewhat to the north of a line joining them, is a star of 11 mag., which, as discovered by J. Herschel, is itself double, and consists of two stars of 11.5 mag., distance 3″. In Herschel's opinion no telescope can distinguish the moons of Uranus if it cannot make these two stars clearly visible. Only large and powerful instruments can do this.
$20^h\ 17^m$	$+19°\ 43'$	4572, **Nebula in Sagitta**, planetary, but described by J. Herschel as capable of being resolved into stars. Lamont speaks of it as a circular mass of nebula having a distinct nucleus in the centre, but without any trace of resolvability. The nucleus was not visible in Herschel's telescope. The nebula is placed between a number of stars. [Spectrum a bright nebulous line of the same refrangibility as the brightest of the lines of nitrogen. Huggins.]
$20^h\ 19^m$	$+40°\ 20'$	4575, **Star Cluster in Cygnus**, a moderately rich but rather small cluster containing stars of 10 to 12 mag., besides several more brilliant.
$20^h\ 20^m$	$-18°\ 36'$	π **Capricorni**, a somewhat yellowish star of 5 mag., with a faint companion 10 mag., d = 3″, p = 146°, discovered by Burnham.
$20^h\ 22^m$	$-18°\ 12'$	ϱ **Capricorni**, 5 mag., with a companion 8 mag., d = 3″, p = 173°. There is also a distant companion 7.5 mag., d = 236″, p = 151°.
$20^h\ 23^m$	$-18°\ 59'$	o **Capricorni**, 5.6 mag., with a companion 7 mag., distance 22″. Recognised as a double star by Bradley.
$20^h\ 27^m$	$+25°\ 24'$	Σ 2695, **Vulpeculae**. The primary is 6 mag. and white, the companion 8 mag. The position of the latter, according to Engelmann's calculations, 1884, d = 1.4″, p = 81.5°.
$20^h\ 28^m$	$+6°\ 59'$	4586, **Nebula in Delphin.** Faint, somewhat brightert owards the centre. A star of 9 mag. precedes it. W. Herschel resolved the nebula into stars.

Right Ascension 1880.	Declination 1880.	
$20^h\ 29^m$	$+\ 60°\ 16'$	4590, **Star Cluster in Cepheus**, a beautiful, rich star cluster from 8′ to 9′ in diameter. Discovered by Herschel 9 Sept., 1798.
$20^h\ 29^m$	$+\ 27°\ 54'$	4591, **Star Cluster in Vulpecula**, discovered by W. Herschel, brilliant, fairly large and rich, containing many brilliant stars densely massed together.
$20^h\ 32^m$	$+\ 14°\ 11'$	β **Delphini** (Σ 2704), a greenish star of 3.4 mag., with a faint companion 11 mag., d = 35.5″, p = 335.6°. There is a second exceedingly faint companion, d = 27.5″, p = 115°. Finally, Burnham found the primary to be itself double, consisting of two stars at a distance of only 0.26″ [of which the period of revolution has been calculated by M. Celoria as seventeen years.]
$20^h\ 33^m$	$+\ 0°\ 4'$	1, **Aquarii**, a star of 5 mag., with two very faint companions (11 mag.) whose positions Burnham calculated in 1879 as follows: d = 55.8″, p = 217.4°; d = 72.9″, p = 38.9°.
$20^h\ 34^m$	$+\ 15°\ 29'$	α **Delphini**, 4 mag., with a companion 9.5 mag., d = 35″, p = 278°. There are in addition three exceedingly faint stars near the primary, d = 20″, p = 225°; d = 45″, p = 350°; d = 81″, p = 114″. Auwers in 1858 found from numerous comparisons that α fluctuates in brilliancy to the extent of about half a magnitude, within a period of about 14 days. Since the date named this change of brilliancy does not seem to have been again noticed.
$20^h\ 36^m$	$+\ 31°\ 52'$	49, **Cygni** (Σ 2716), 6 mag. and yellowish, with a blueish companion 8 mag., distance 2.7″. In both stars the colours are easily recognisable.
$20^h\ 40^m$	$+\ 15°\ 58'$	*T* **Delphini**, variable, discovered by Baxendell in 1860. At maximum it does not exceed 8 and often scarcely 9 mag., at minimum it is 13 mag. Period 331 days.
$20^h\ 41^m$	$+\ 30°\ 18'$	4600, **Nebula in Cygnus**, a remarkable, irregular nebula, fairly bright and large. It extends beyond 52 Cygni. Discovered by Herschel 7 Sept., 1784; as seen by him it extended over more than 1°, indeed, with the highest magnifying power, almost 2°. [The spectrum, according to Huggins, is a continuous one.]
$20^h\ 41^m$	$+\ 15°\ 42'$	γ **Delphini** (Σ 2727), a star of 4 mag., golden yellow in colour, with a greenish-blue companion 5 mag., distance 11″.
$20^h\ 41^m$	$+\ 30°\ 17'$	52, **Cygni** (Σ 2726), yellowish, 4 mag., with a companion 9 mag., distance 6.2″.
$20^h\ 42^m$	$+\ 33°\ 56'$	*T* **Cygni**, recognised as variable by Schmidt in 1864, it is usually about 6 mag., and yellowish-white in colour. The changes of brilliancy are slight but unmistakable.
$20^h\ 43^m$	$+\ 36°\ 3'$	λ **Cygni**, 5 mag., with a companion 10.5 mag., distance 85″, position angle 104°. Struve discovered that the primary is itself double, consisting of two stars of 5.5 mag., distance 0.6″. A very difficult object.
$20^h\ 44^m$	$-\ 5°\ 35'$	*T* **Aquarii**, recognised as variable by Goldschmidt in 1861. At maximum it is often somewhat above 7 mag., but at minimum it diminishes to 13 mag. Period 203 days.
$20^h\ 45^m$	$-\ 6°\ 4'$	4, **Aquarii** (Σ 2729), a very difficult double star. The primary is 6 mag., and somewhat yellowish, the companion 8 mag. According to Burnham (1879), the distance is only 0.6″, position angle 167°.

Right Ascension 1880.	Declination 1880.	
$20^h\ 47^m$	$-12°\ 59'$	4608, **Star Cluster in Capricornus,** discovered by Méchain as a faint nebula. Messier, too, observed it, and remarked a small telescopic star close to it. Herschel, in 1783, resolved the nebula into stars, and the 40-foot reflector, 4 Oct., 1810, with a magnifying power of 280, showed separate stars even in the centre of the cluster. It is nearly 2′ in diameter. Several other stars appeared in the field of vision, but they were, as Herschel remarked, quite distinct from the minute points of light to be found in the cluster itself.
$20^h\ 50^m$	$+\ 4°\ 4'$	Σ 2735, **Equulei,** a star 6 mag., with a companion 8 mag., d = 1.8″, p = 287°.
$20^h\ 53^m$	$+\ 3°\ 50'$	1, **Equulei,** (Σ 2737) a yellowish star of 5 mag., with a blueish companion 7 mag., distance 10.8″. The primary, as discovered by Struve, is a narrow double star of 5.7 and 6 mag., distance, according to Engelmann (1884), 1.26″.
$20^h\ 56^m$	$+\ 15°\ 45'$	4625, **Nebula in Delphinus,** fairly brilliant, not large, round, brighter at the centre.
$20^h\ 56^m$	$+\ 47°\ 3'$	59, **Cygni** (Σ 2743), 5.6 mag., with a companion 9.5 mag., d = 20″, p = 352°.
$20^h\ 56^m$	$+\ 6°\ 42'$	2, **Equulei** (Σ 2742), two stars of 6 mag., distance 2.6″. No perceptible change has been observed in their relative positions during the last fifty years.
$20^h\ 56^m$	$+\ 47°\ 3'$	f^1 **Cygni** (Σ 2743), a star of 5.6 mag., greenish-white, with a companion 9 mag., d = 20″, p = 352°; there is also a second companion 10.5 mag., d = 26.7″, p = 141°.
$20^h\ 57^m$	$+\ 1°\ 4'$	Σ 2744, **Equulei,** a star of 6 mag., with a companion 7 mag., distance 1.5″.
$20^h\ 58^m$	$-\ 11°\ 50'$	4628, **Nebula in Aquarius,** a beautiful, planetary nebula, discovered by W. Herschel, 7 Sept., 1782. The disc appears to be somewhat blurred at the edges in a telescope of medium strength. Lassell saw a bright ring within the nebula, and Rosse calls it "Saturn nebula." The spectrum, according to Huggins, shows it to be of a gaseous nature. Vogel also finds the three bright lines in it.
$20^h\ 58^m$	$-\ 6°\ 18'$	12, **Aquarii,** 6 mag., with a companion 8 mag., d = 3″, p = 190°.
$20^h\ 59^m$	$+\ 23°\ 21'$	*R* **Vulpeculae,** a variable star, which at maximum seldom reaches 7.5 mag., and at minimum disappears even in the most powerful telescopes. Period nearly 140 days. Discovered at Bonn in 1858.
$21^h\ 1^m$	$+\ 38°\ 10'$	61, **Cygni** (Σ 2758), 5 mag., with a companion 6 mag., both golden yellow in colour, but of slightly different tints. The distance is 20″, and the change of position is rapid; it has not yet been possible, however, to calculate the period of revolution. [Dr. Peter's, in 1885 (Ast. Nach., Nos. 2708-9), has set forth provisionally the data of the system. The period is reckoned to be approximately 783 years.] According to Struve, the parallax of this star is 0.5″ [*see note p.* 8], its distance from the earth is, therefore, about twenty billion miles.
$21^h\ 3^m$	$+\ 41°\ 45'$	**Nebula in Cygnus,** recognised by Webb, 14 Nov., 1879, as a star of 9 mag., surrounded by nebula. Schmidt describes the nebula as elongated in shape, being 8″ to 10″ in length, condensed towards the centre, which seems of a stellar nature. Vogel finds the spectrum to contain the three bright lines very clearly marked, the rest of the spectrum being faint and continuous.

Right Ascension 1880.	Declination 1880.	
$21^h\ 5^m$	$+\ 9°\ 39'$	γ **Equulei**, 5 mag., yellow, with a companion 6 mag., distance 366″. The primary is itself double, having a small star 10 mag. at d = 2.1″, p = 274.5°. Burnham also saw a very faint star, d=41″, p=10°.
$21^h\ 7^m$	$+\ 45°\ 11'$	4645, **Star Cluster in Cygnus**, an extensive but not very rich cluster of stars of 10 mag. A star of 7 mag. follows it on its edge.
$21^h\ 8^m$	$+\ 67°\ 54'$	*T* **Cephei**, recognised as variable by Ceraski in 1879. At maximum the star is 5.5, at minimum 9 mag. Period 390 days.
$21^h\ 8^m$	$+\ 59°\ 29'$	Σ 2780, **Cephei.** The primary is 6, the companion 7 mag., and both are white. Wilson (1873) calculates, d = 1.0″, p = 224.3°. No change of position has been observed since the time of Struve.
$21^h\ 9^m$	$+\ 9°\ 31'$	δ **Equulei** (Σ 2777), 5 mag. and yellowish, with a companion 10 mag. In 1852 Otto Struve found that the primary is itself double, having a companion 10.5 mag. near to it. Burnham (1880) calculates: A B d = 0.35″, p = 29°. A C d = 22.7″, p = 37.9°. The primary can only be divided with a most powerful instrument. [The motion of the two is the quickest known. Burnham has shown that the period of $11\frac{1}{3}$ years is too short.]
$21^h\ 10^m$	$+\ 37°\ 32'$	τ **Cygni**, 4 mag., a difficult double star, discovered by Clark in 1874. According to Burnham, the companion is at d = 1″, p = 150°. Hall saw another very faint companion, d = 16″, p = 260°.
$21^h\ 13^m$	$+\ 34°\ 23'$	υ **Cygni**, a star of 4.5 mag., with two faint companions of 10 mag., d = 15, p = 219°, and d = 21.5″, p = 178°.
$21^h\ 16^m$	$+\ 58°\ 7'$	Σ 2790, **Cephei**, 6 mag. and red, with a companion 10.5 mag., d=4.5″, p=46.5°.
$21^h\ 17^m$	$+\ 19°\ 17'$	1 **Pegasi**, a yellow star 4·5 mag., with a companion 8.9 mag., d=37″, p=301°.
$21^h\ 17^m$	$+\ 6°\ 18'$	β **Equulei**, 5 mag., with a companion 10.5 mag., d = 67″, p = 309°, and, in addition, a second companion 11 mag., d = 86″, p = 276°. The first companion is itself a double star of 10 and 11 mag., distance 6.5″. Burnham also found a very faint star, d = 32″, p = 260°. This latter is visible in a very powerful telescope only.
$21^h\ 24^m$	$+\ 11°\ 39'$	4670, **Star Cluster in Pegasus**, recognised as a nebula by Maraldi as far back as 1745. Herschel resolved it into a globular cluster of stars. With a 5-inch refractor it has this appearance, though the centre cannot be resolved. At the edges are scattered a large number of stars of from 11 to 12 mag. Diameter 3′—4′.
$21^h\ 27^m$	$-\ 1°\ 21'$	4678, **Nebula in Aquarius.** In the average telescope this appears to be of moderate brilliancy and circular, with a small faint star at the eastern edge. Discovered in 1746 by Maraldi, was resolved into stars by Herschel.
$21^h\ 27^m$	$+\ 70°\ 2'$	β **Cephei** (Σ 2806), a greenish-white star of 3 mag., with a companion 8 mag., d = 13.6″, p = 250°.

Right Ascension 1880.	Declination 1880.	
$21^h\ 28^m$	$+\ 47°\ 54'$	4681, **Star Cluster in Cygnus**, a large and beautiful cluster, discovered by Messier in 1764, visible in a small telescope.
$21^h\ 32^m$	$+\ 6°\ 5'$	3, **Pegasi**, a star of 6 mag., with a companion 7.5 mag., d = 39″, p = 349°. No change of position has been noticed since it was first observed by W. Herschel.
$21^h\ 34^m$	$-\ 23°\ 43'$	4687, **Star Cluster in Capricornus**, described by Messier as a strip of starless nebula visible only with difficulty. It can be resolved into stars with a 5-inch refractor. Herschel saw the stars with a 10-foot reflecting telescope.
$21^h\ 35^m$	$+\ 56°\ 54'$	Σ 2816, **Cephei**. Triple, with a distant companion. The primary A is 6 mag., B 8, C 8, D 9. Wilson and Seabroke's calculations (1873) are as follows: A B p = 122.3°, d = 11.7″; A C p = 339.9°, d = 19.8″; A D p = 174.2°, d = 50″.
$21^h\ 37^m$	$+\ 78°\ 5'$	*S* **Cephei**, a red star recognised as variable by Hencke in 1855. At maximum it never exceeds 7.5 mag., and at minimum it diminishes to 12 mag. Period about 485 days.
$21^h\ 37^m$	$+\ 42°\ 18'$	**Nova Cygni**, discovered 24 Nov., 1876, by Schmidt as a yellow star of 3 mag. It was at once apparent that a decrease of brilliancy was taking place, and in Sept., 1877, the star was only 10.5 mag.; in the following year it was only 13—14 mag., and invisible except in the most powerful telescopes. The spectrum at the time of greatest brilliancy contained eight bright lines indicating the presence of hydrogen, natrium and magnesium. Finally these were reduced to a single bright line accompanied by only the traces of a continuous spectrum, and bearing a close resemblance to the spectrum of a planetary nebula. At the Dunecht Observatory a sketch was made, by means of a 15-inch refractor, of the surroundings of Nova within a radius of 7.5′.
$21^h\ 38^m$	$+\ 9°\ 20'$	ε **Pegasi**. The primary is 2.3, the companion 8 mag. This latter was first seen by W. Herschel, 20 Nov., 1782. South (1825) gives the following measurements: d = 138.5″, p = 323°. According to Schmidt and Seidel the primary seems to be variable in a slight degree.
$21^h\ 39^m$	$+\ 28°\ 12'$	μ **Cygni**, (Σ 2822), a star of 4.5 mag., with a beautiful blue companion 5 mag., distance 3.8″, besides a companion of 7 mag., d = 208.7″, p = 57°. Burnham saw another star of 11.5 mag., d = 35.5,″ p = 264°.
$21^h\ 39^m$	$+\ 25°\ 6'$	κ **Pegasi**, (Σ 2824), a star of 4 mag., with a very faint companion 11 mag., d = 11″, p = 308°. Burnham discovered that the primary is itself double, but the companion is only at distance 0.27″. The two stars differ about half a magnitude in brilliancy.
$21^h\ 40^m$	$+\ 58°\ 14'$	μ **Cephei**, of a deep red colour, and varies between 4 and 5 mag.; period not yet ascertained. The star has two companions, but they are both very faint.
$21^h\ 43^m$	$+\ 65°\ 12'$	4709, **Star Cluster in Cepheus**, fairly large, rich in stars, densely massed together. In large telescopes a very beautiful object.

Right Ascension 1880.	Declination 1880.	
$21^h\,48^m$	$+\,55°\;15'$	Σ 2840, **Cephei**, a star of 6 mag., somewhat greenish in colour, with a companion 7 mag., d = 20″, p = 195°.
$21^h\,55^m$	$+\,12°\;33'$	20, **Pegasi**, 6 mag. As discovered by Burnham, this star has an exceedingly faint companion of 13 mag., d = 51″, p = 326°.
$22^h\;0^m$	$+\,64°\;2'$	**ξ Cephei**. Primary yellowish, 4.5 mag., companion blueish, 6.7 mag. Struve, in 1831, calculated as follows, d = 5.6″, p = 289°.
$22^h\;1^m$	$+\,45°\;54'$	4755, **Star Cluster in Lacerta.** Large, fairly rich. Some of the stars are from 8 to 10 mag.
$22^h\;5^m$	$+\,58°\;42'$	Σ 2872, **Cephei.** Primary 6 mag., companion 6.5 mag., d = 21.7″, p = 316.4°. The companion is itself double, consisting of two stars of 7 mag., distance only 0.6″.
$22^h\;8^m$	$-\,21°\;40'$	41, **Aquarii**, 5.6 mag., and yellowish, with a companion 8.9 mag., d = 5.1″, p = 116°.
$22^h\;8^m$	$+\,69°\;32'$	Σ 2883, **Cephei**, 6 mag., with a blueish companion 8.2 mag., d = 15″, p = 255°.
$22^h\,10^m$	$+\,49°\;17'$	4773, **Star Cluster in Lacerta.** Coarsely scattered, with a good many fairly brilliant stars; diameter 16′. In it is to be seen the double star Σ 2890.
$22^h\,11^m$	$+\,72°\;43'$	Σ 2893, **Cephei**, yellowish, 6 mag. There is a star 8 mag., d = 29″, p = 348°.
$22^h\,18^m$	$+\,20°\;15'$	33, **Pegasi** (Σ 2900). Triple. The primary (A) 6; the nearer companion (B) 9; the farther (C) 7.5 mag. Dembowski gives the following measurements, 1863: A B d = 2.3″, p = 178°. A C d = 60.5″, p = 334°.
$22^h\,23^m$	$-\;0°\;38'$	**ζ Aquarii** (Σ 2909). Even Chr. Mayer knew this star to be double, and the fact is easily verified. The primary is 4, the companion 4.1 mag., d = 3.5″, and both are a greenish-white colour. Since Herschel's time, the distance has decreased, the position angle has also changed considerably.
$22^h\,24^m$	$+\;3°\;49'$	37, **Pegasi** (Σ 2912). A star of 6 mag., with a companion 7 mag. When discovered by Struve (in 1831) the distance was 1.2″, but it has since considerably decreased, and Burnham, in 1880, found it impossible to divide the star. [Doberck's calculation of a period of 1578 years is uncertain.]
$22^h\,25^m$	$+\,57°\;48'$	**δ Cephei**, yellowish-red in colour and variable; it is the primary of a double star system. At maximum it is nearly 4 mag., at minimum almost 5 mag. Period $5\frac{1}{3}$ days, the changes of brilliancy succeed one another quite regularly.
$22^h\,31^m$	$+\,39°\;1'$	8, **Lacertae** (Σ 2922), quadruple, A = 6, B = 6.5, C = 10, D = 8.5 mag. Burnham's calculations are: A B d = 22.3″, p = 186°. B C d = 27.9″, p = 155°. A D d = 81.5″, p = 144°. B D d = 66.5″, p = 13.1°.

Right Ascension 1880.	Declination 1880.	
$22^h\ 31^m$	$+\ 33°\ 43'$	4815, **Nebula in Pegasus**, fairly bright and large, with a sudden increase of brilliancy towards the centre. [Spectrum continuous.]
$22^h\ 37^m$	$+\ 29°\ 36'$	π **Pegasi**, 3 mag., with a companion 10.5 mag., observed by Herschel and South, d = 90″, p = 339°.
$22^h\ 41^m$	$-\ 14°\ 41'$	69, **Aquarii** (Σ 2943), a star of 6 mag., with a companion 9 mag., d = 28″, p = 115°.
$22^h\ 41^m$	$+\ 11°\ 34'$	ξ **Pegasi**, 5 mag., with a companion 10.5 mag. (observed by J. Herschel), d = 12″, p = 113°. Burnham also saw a star of 11 mag., d = 128″, p = 21.8°.
$22^h\ 43^m$	$-\ 14°\ 13'$	τ **Aquarii**, 4 mag. and red, with a companion 5.5 mag., distance 130″.
$22^h\ 51^m$	$-\ 20°\ 59'$	*S* **Aquarii**, a star of a deep reddish-yellow colour, recognised as variable by Argelander in 1853. At maximum it is only 8 mag., at minimum 12 mag. Period 280 days.
$22^h\ 58^m$	$+\ 27°\ 26'$	β **Pegasi.** The primary is variable, at maximum it is 2.2, at minimum 2.7 mag. The changes of brilliancy are somewhat irregular, and are accompanied (or caused) by a change in the reddish tint of the star. The companion, which was observed by J. Herschel, is faint; and in 1878 the measurements were d = 99″, p = 208°.
$23^h\ 4^m$	$+\ 74°\ 44'$	π **Cephei**, observed by J. Herschel as a double star, but found to be triple by the refractor at Pulkowa; the primary being itself double. The central star is 5 mag. The farther companion 11 mag. The nearer companion, which was first seen in the great refractor at Pulkowa is, according to Struve, 8.9 mag., distance 1.5″.
$23^h\ 10^m$	$-\ 9°\ 44'$	ψ **Aquarii**, an easily-observed double star, recognised as such even by Chr. Mayer. According to Struve the primary is 4.5 mag., and of a deep yellow colour. The companion is 8.5 mag. and blue. Distance 49.6″.
$23^h\ 13^m$	$-\ 14°\ 6'$	94, **Aquarii** (2998), recognised as a double star by W. Herschel, 20 Aug., 1781. The primary is 6 mag. and yellowish-white, the companion 7 mag. and blue. The companion's change of position is slight, but the mutual motions of the stars show a physical relation between them.
$23^h\ 14^m$	$+\ 67°\ 27'$	o **Cephei** (Σ 3001). The primary (deep yellow) is 5.5 mag., the companion (deep blue) 7.8 mag. The position of the companion seems to change pretty rapidly. Distance 27″, position angle 192°.
$23^h\ 14^m$	$+\ 8°\ 16'$	*S* **Pegasi**, a variable star, of a yellowish-red colour. At maximum it is occasionally 7 mag., but faint, at minimum it is only 12 mag. Nothing is known with regard to its period.
$23^h\ 19^m$	$+\ 60°\ 56'$	4957, **Star Cluster in Cepheus.** Discovered by Messier 7 Sept., 1774, and described as follows: "A cluster of very small stars mingled with nebula. Can only be seen with an achromatic telescope." The cluster is preceded by two stars of 7 and 8 mag., and followed by one brilliant star. It contains one star of an orange colour.

Right Ascension 1880.	Declination 1880.	
$23^h\ 21^m$	$+\ 41°\ 52'$	4964, **Nebula in Andromeda,** a small, brilliant, planetary nebula; 15″ in diameter, discovered by W. Herschel, 6 Oct., 1784. Lassell recognised in it a nucleus with two oval rings, Rosse a spiral arrangement. The spectrum (according to Huggins) contains four bright lines indicating a gaseous nature. [One of these lines, near W. L. 470, occurs only in this and the Orion Nebula.]
$23^h\ 38^m$	$-\ 15°\ 57'$	*R* **Aquarii,** a star of a somewhat deep red colour, recognised as variable by Harding in 1811. It varies from 6 to 11 mag. Period apparently somewhat under 390 days.
$23^h\ 40^m$	$-\ 19°\ 21'$	107, **Aquarii,** 5.6 mag., with a blueish-white companion 7 mag., d = 5.2″, p = 138°.
$23^h\ 46^m$	$+\ 15°\ 39'$	5023, **Star Cluster in Pegasus.** A cluster of coarsely scattered stars of 10 mag. and upwards.
$23^h\ 51^m$	$+\ 56°\ 3'$	5031, **Star Cluster in Cassiopeia.** Discovered by Caroline Herschel in 1783, between ϱ and σ Cassiopeia. The stars are numerous but not brilliant, and the whole object is a beautiful sight in a powerful telescope.
$23^h\ 52^m$	$+\ 50°\ 43'$	*R* **Cassiopeiae,** recognised as variable by Pogson in 1853, of a deep red colour. At maximum it is 5.5, at minimum 12 mag. The period is about 426 days and seems to be decreasing.
$23^h\ 53^m$	$+\ 55°\ 5'$	σ **Cassiopeiae** (Σ 3049). Discovered to be double by W. Herschel, 31 Aug., 1780. The primary is 5.4 mag. and greenish, the companion 7.5 and deep blue in colour. The colours in both are very intense. The position of the companion does not seem to alter, d = 3″, p = 326°.
$23^h\ 53^m$	$+\ 33°\ 4'$	Σ 3050, **Andromedae,** two stars 6 mag., distance 2.9″.
$23^h\ 56^m$	$+\ 26°\ 27'$	85 **Pegasi.** A star of 6 mag., with a companion 9 mag., d = 15″. p = 30°, also an exceedingly faint companion 13 mag., d = 62″, p = 277°. Finally, Burnham (1878) found that the primary is itself double, there being an extraordinarily faint star near it, distance only 0.7″, position angle 287°. This companion cannot be discerned save in an instrument of the first class.

Editorial Note.—In "The Extension of the Law of Gravitation to Stellar Systems," by Prof. Asaph Hall (Gould's Astron. Journal, 177), it is shown that there is a theoretical difficulty in applying Newton's Law of Gravitation to double stars, a difficulty which is increased by the so-called "runaways" stars, like Groombridge, 1830, and μ Cassiopeia, stars moving through space with the speed of a comet at perihelion, and yet with no visible attracting body near them. Prof. Hall's recent determination of the parallax of Arcturus (only $+\ 0''.018 \pm 0''.022$), if accepted, brings this star within that category, for it has a great proper motion (amounting to 373 miles per second at right angles to line of sight, and 55 miles per second in the line of sight). The following Table gives some of the stars of which the parallax, and motion across, have been ascertained:—

Star's Name.	Magnitude.	Parallax =	Distance in years of light.	Annual Motion across.	= Miles per second.
α Centauri	1	0·″75	4·35	3·″674	14·4
61 Cygni	5	0·467	7·00	5·160	35·
Lalande 21,185 . .	7	0·501	6·50	4·750	27·8
Groombridge 34 . .	8	0·290	11·00	2·801	28·3
Lalande 21,285 . .	8·5	0·262	12·40	4·403	49·2
Arg. Œltzen 17,415 .	9·5	0·247	13·60	1·270	15·
Sirius	1	0·390	8·00	1·310	9·8
70 Ophiuchi . . .	4	0·150	21·7	1·13	22·
α Lyræ	1	0·034	96·	0·36	31·
Groombridge 1830 .	7	0·089	36·6	7·05	232·
θ Ursæ Majoris . .	3	0·046	70·9	1·11	70·7
α Bootis	1	·127	25·44	2·258	373·
Pole Star	2	·05	63·	0·045	2·5

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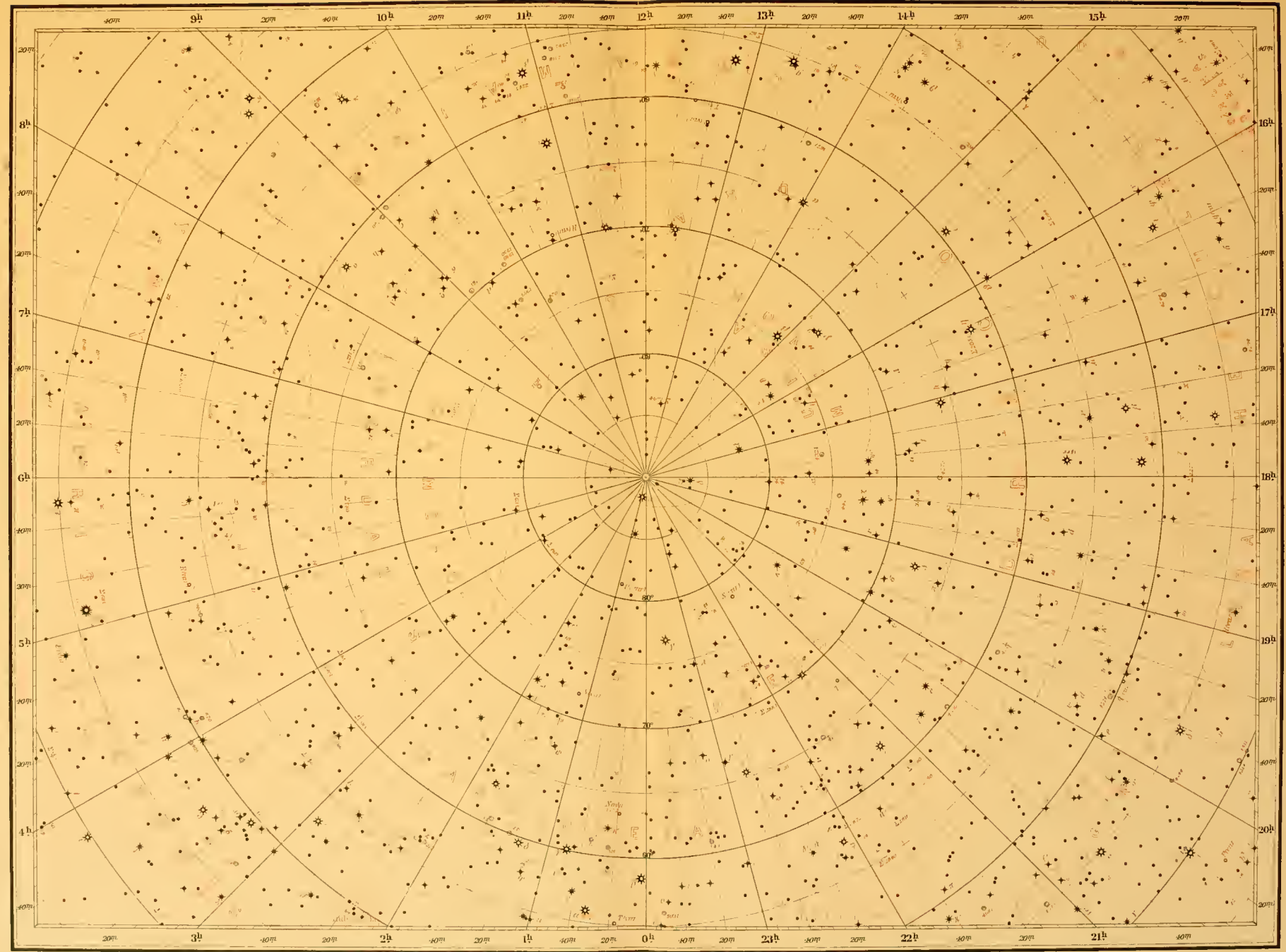


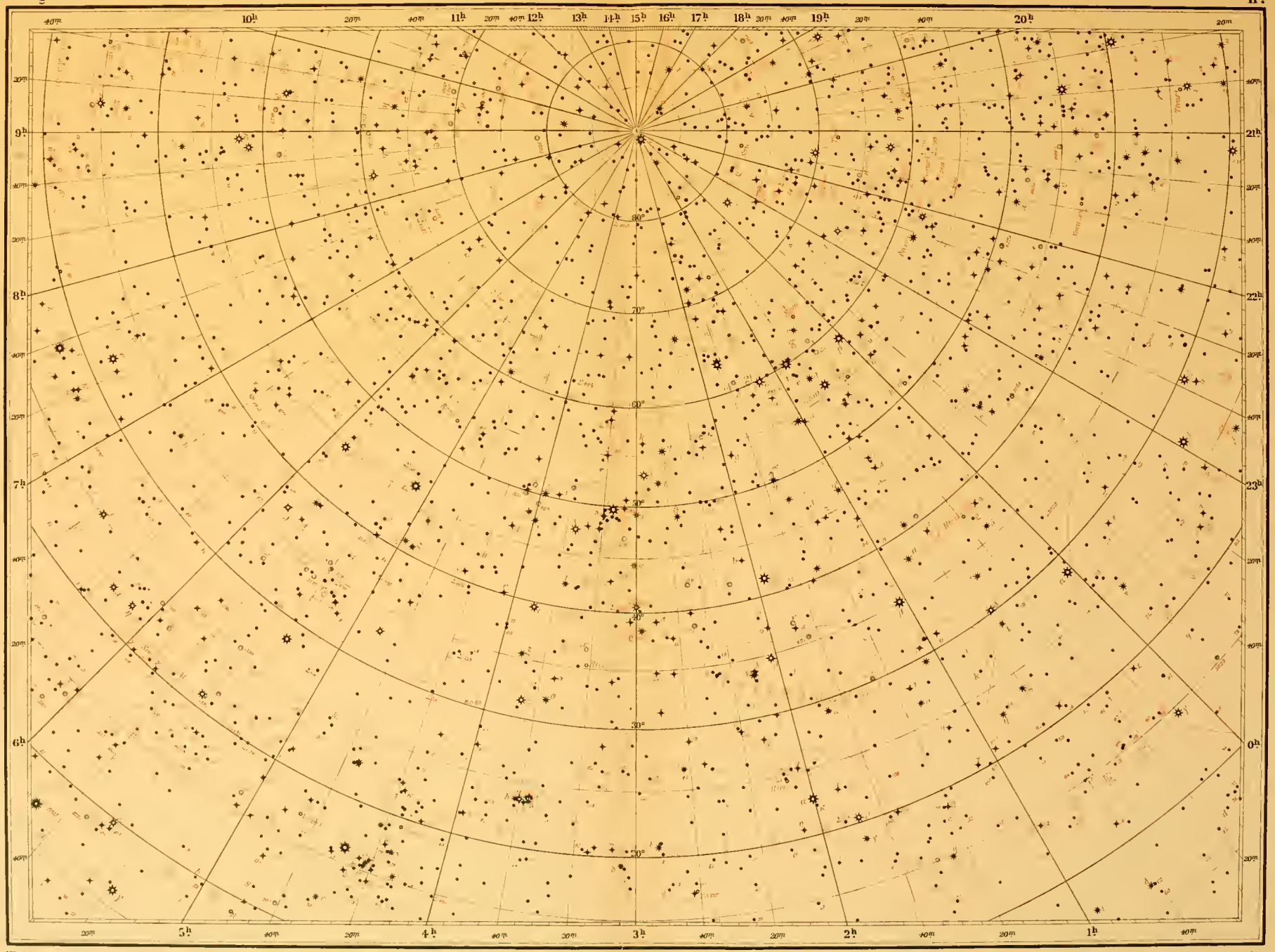
Klein, Star Atlas.

1m 2m 3m 4m 5m 6m & 6.5m variable nebula or cluster

Society for Promoting Christian Knowledge, London.

Right Ascension = 3h Declination = +58°

II.

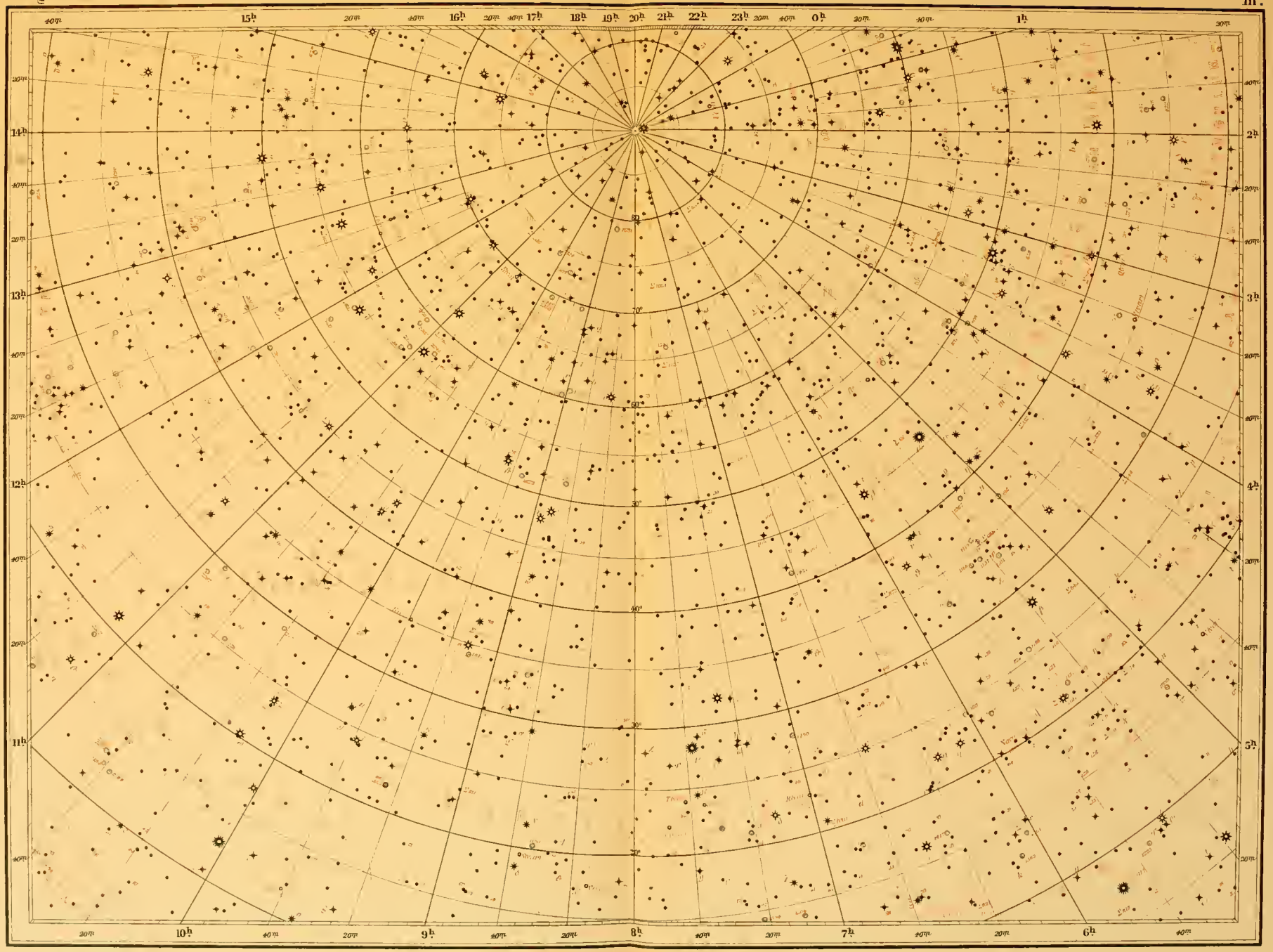


Klein, Star Atlas.

S. P. C. K. London.

1m 2m 3m 4m 5m 6m & 6.5m var. st. nebula or cluster

Right Ascension = 8h Declination = 58°



Klein, Star Atlas.

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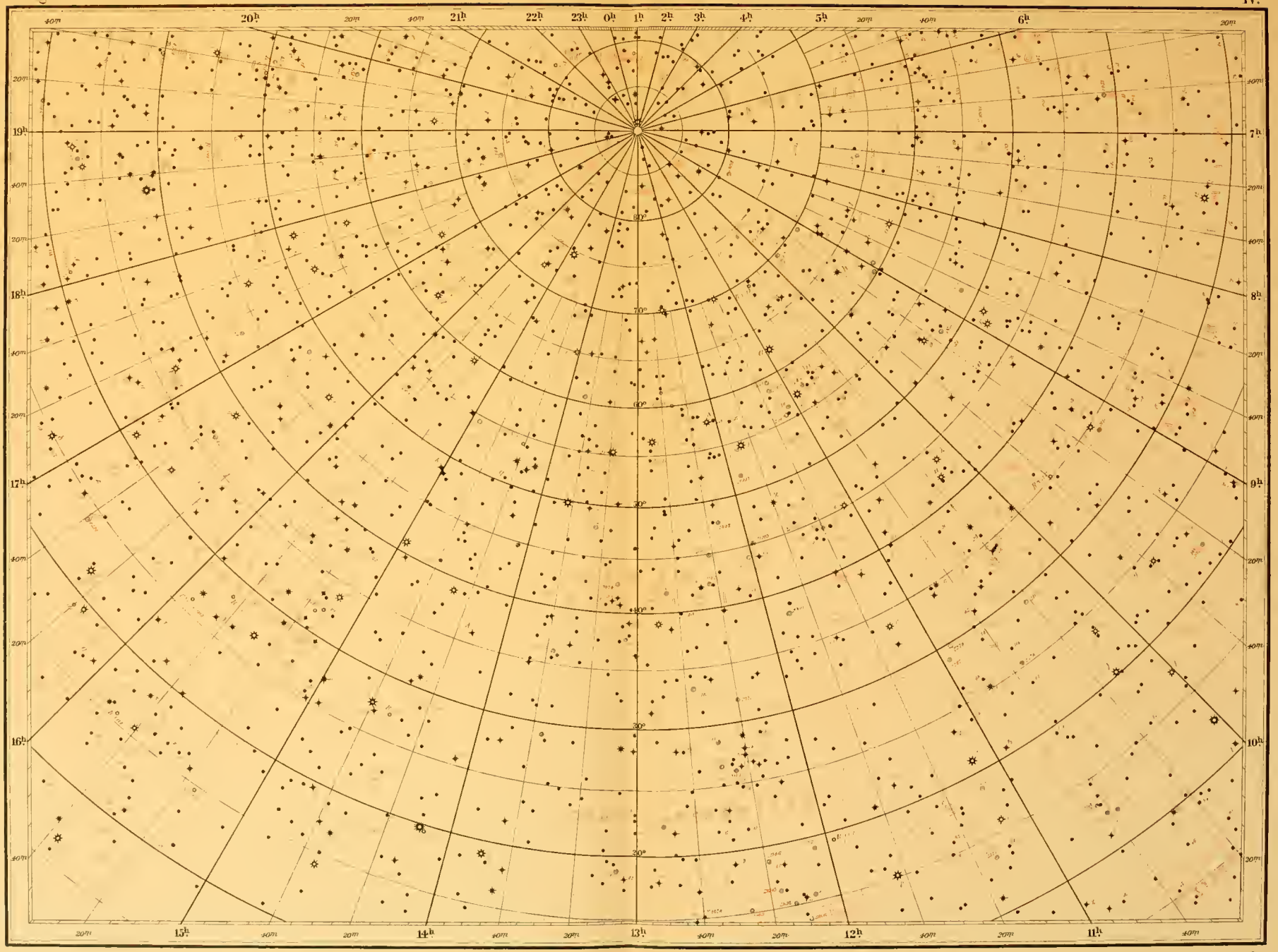
1m 2m 3m 4m 5m 6m & 6.5m var. st. nebula or cluster

Right Ascension = 13h Declination = +58°



Klein, Star Atlas.

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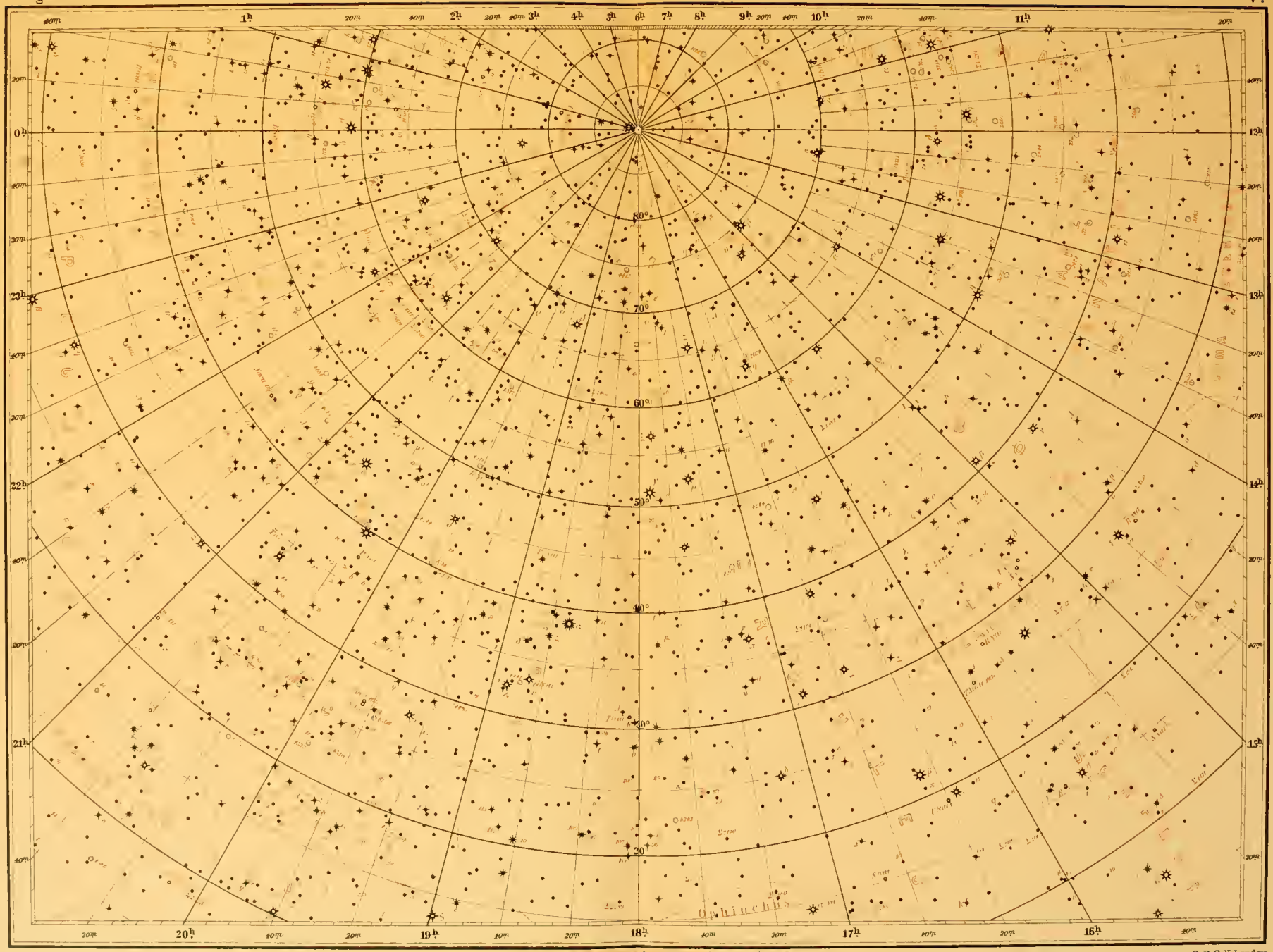
1m 2m 3m 4m 5m 6m & 6.5m var. st. nebula or cluster



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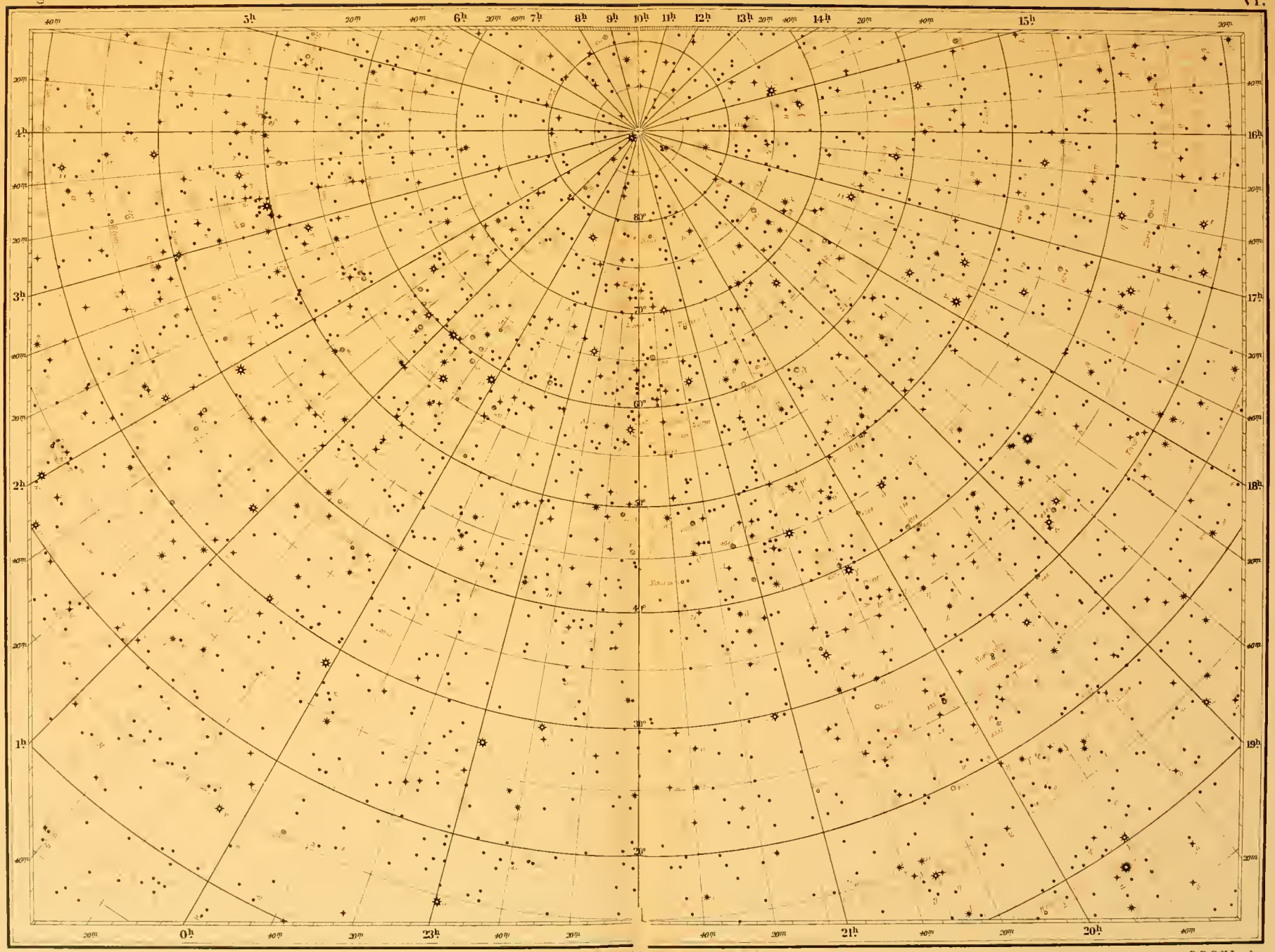
1m 2m 3m 4m 5m 6m & 6.5m var. st. nebula or cluster



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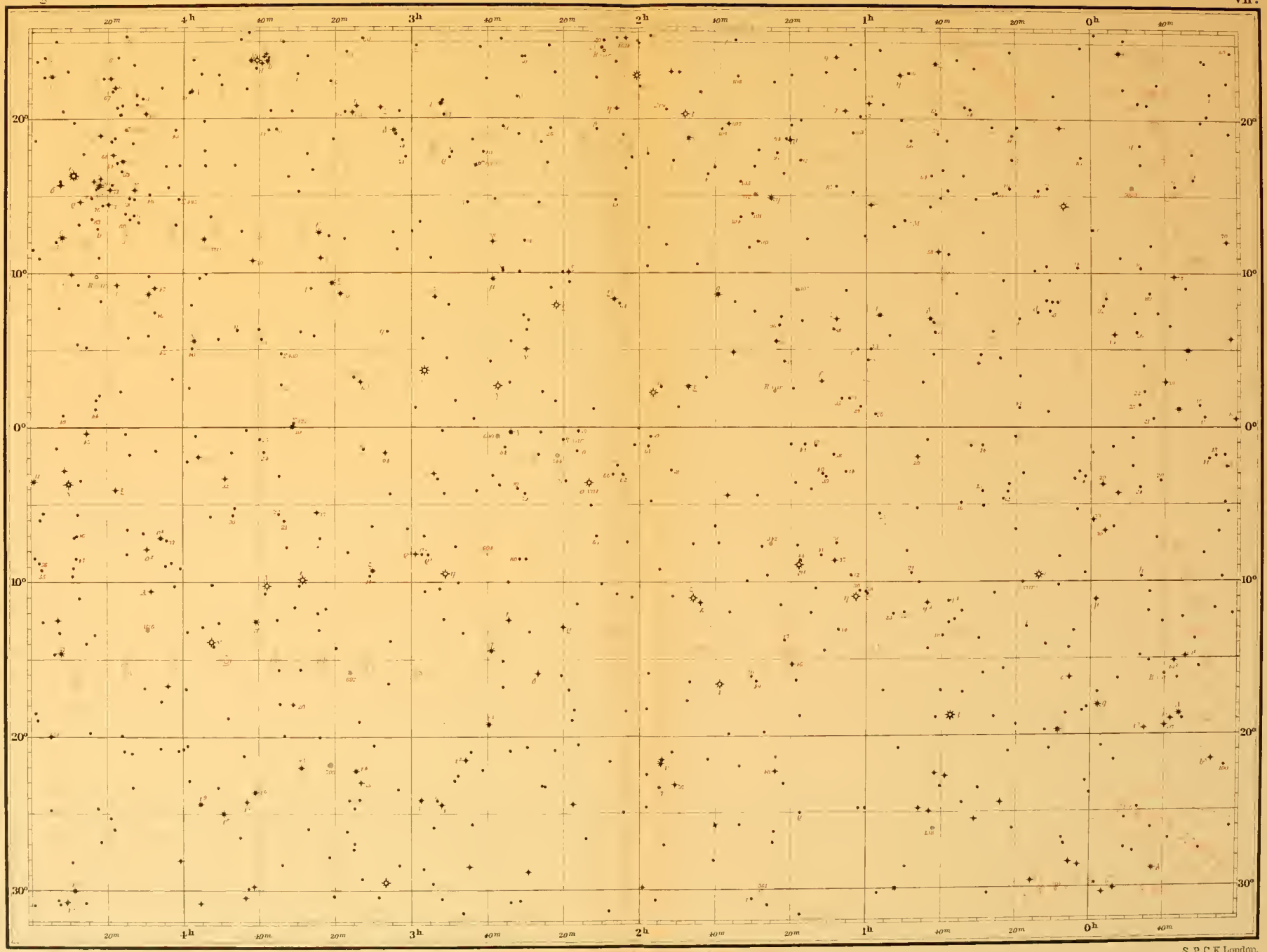
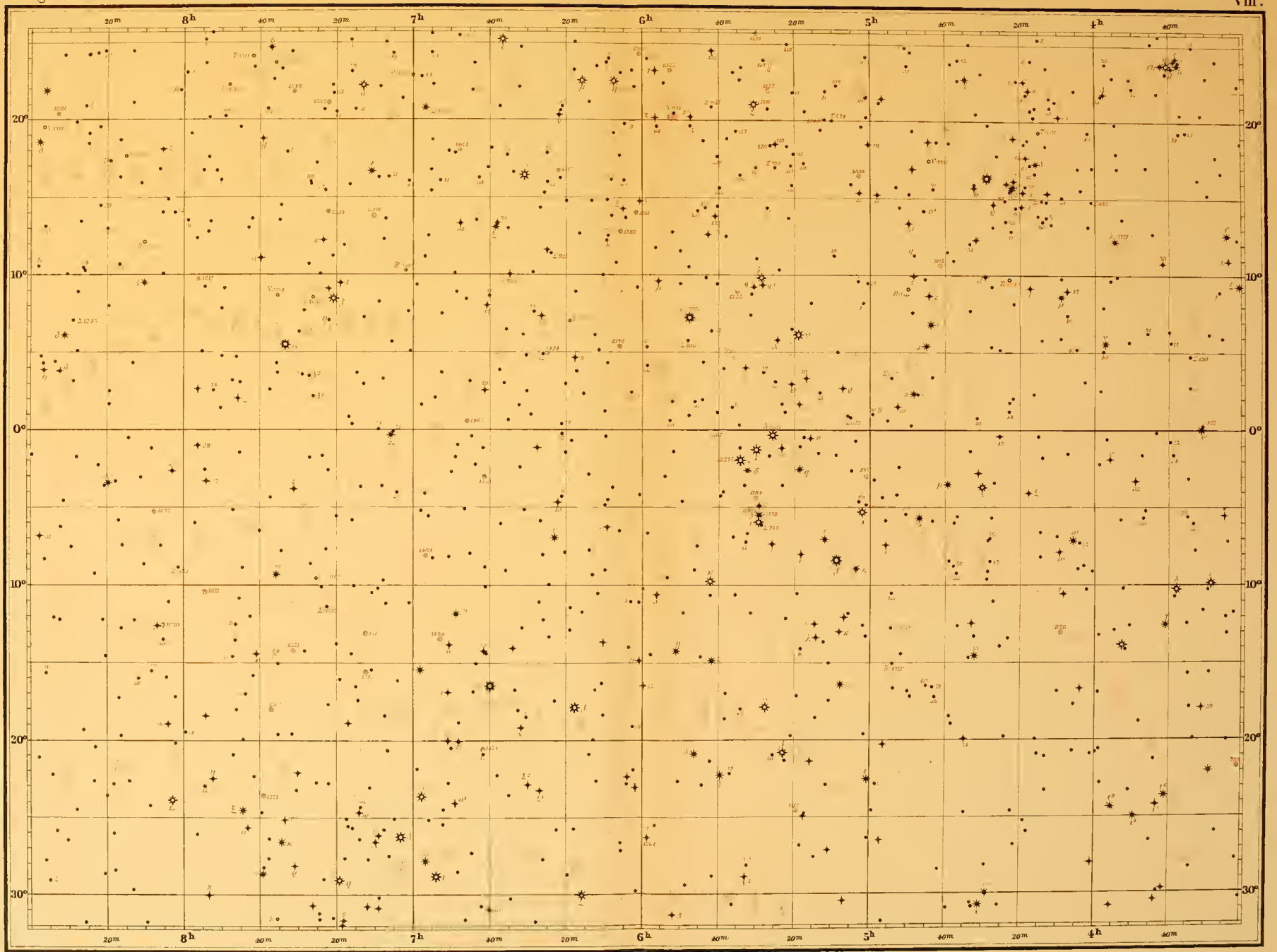
1m 2m 3m 4m 6m & 6.5m var. st. nebula or cluster



1m 2m 3m 4m 5m 6m & 6.5m var. st. nebula or cluster



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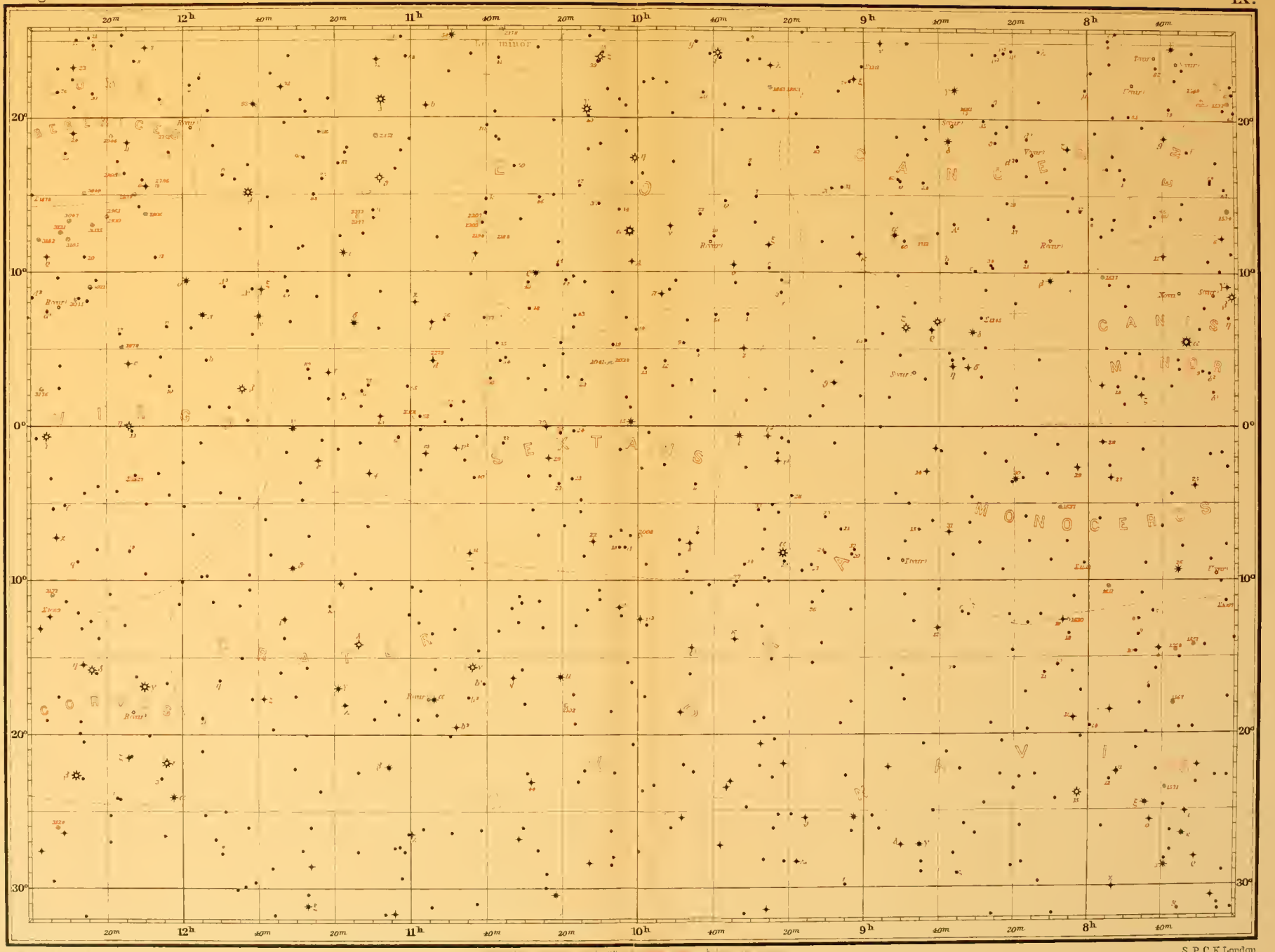

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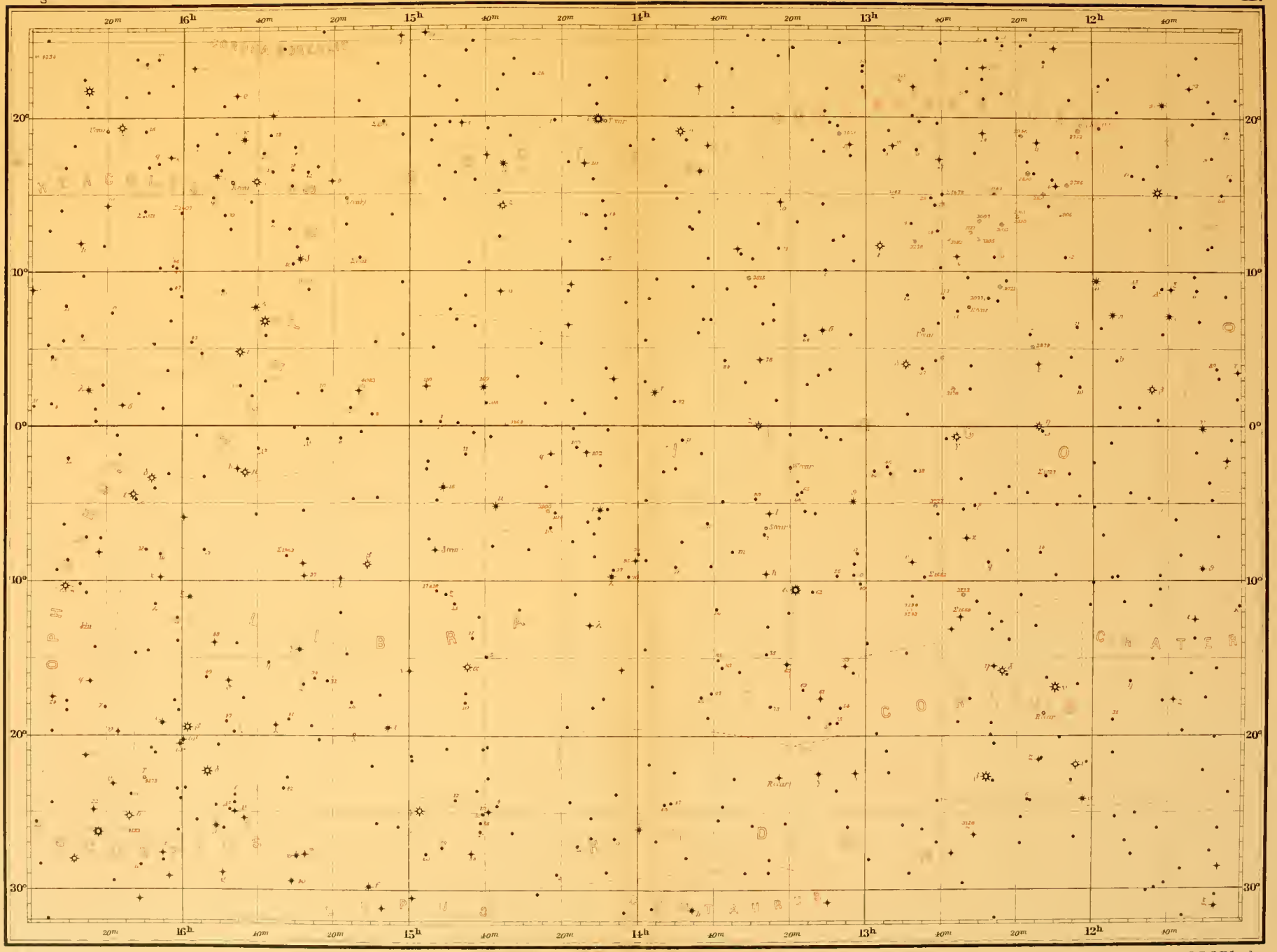

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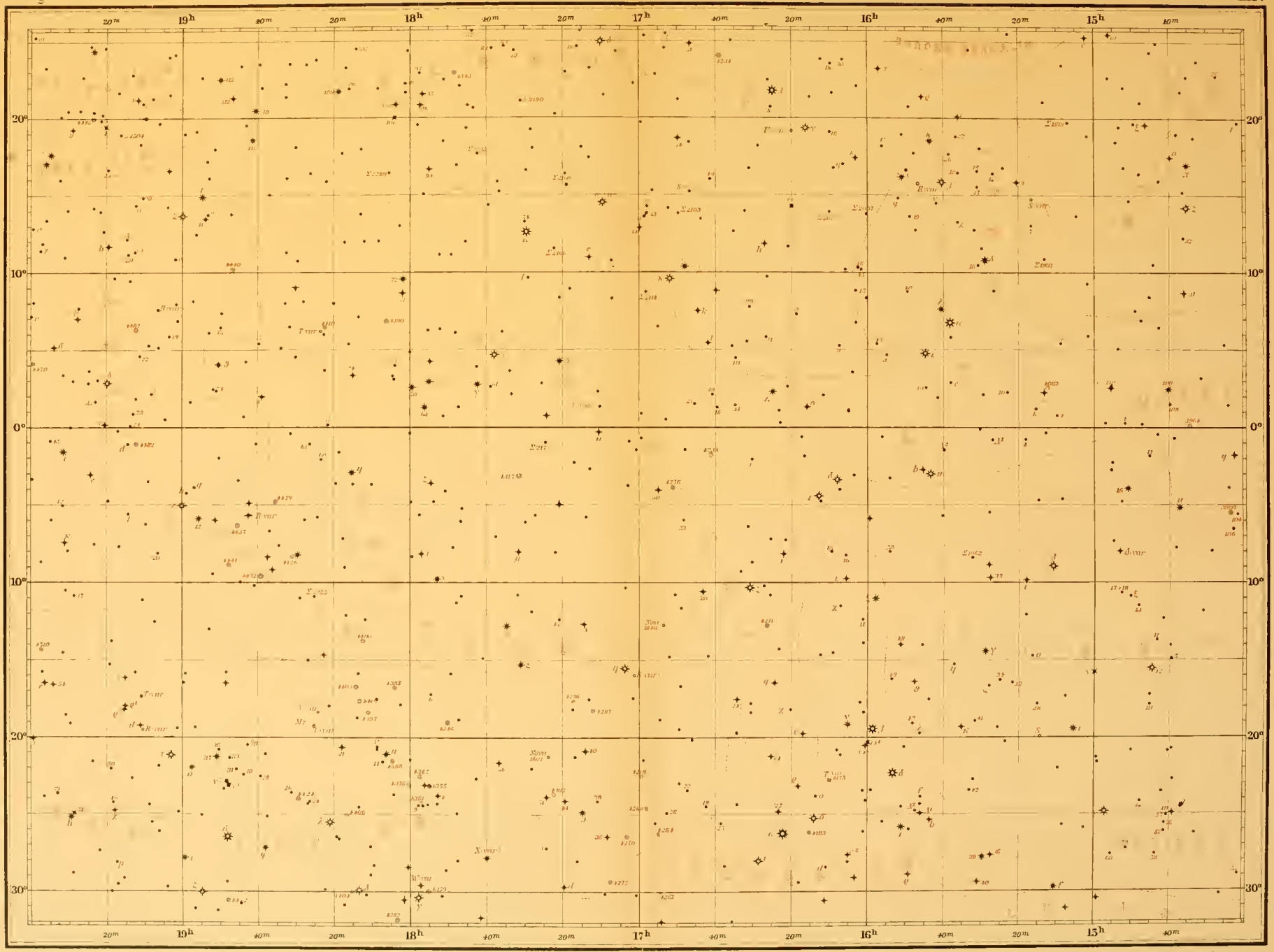

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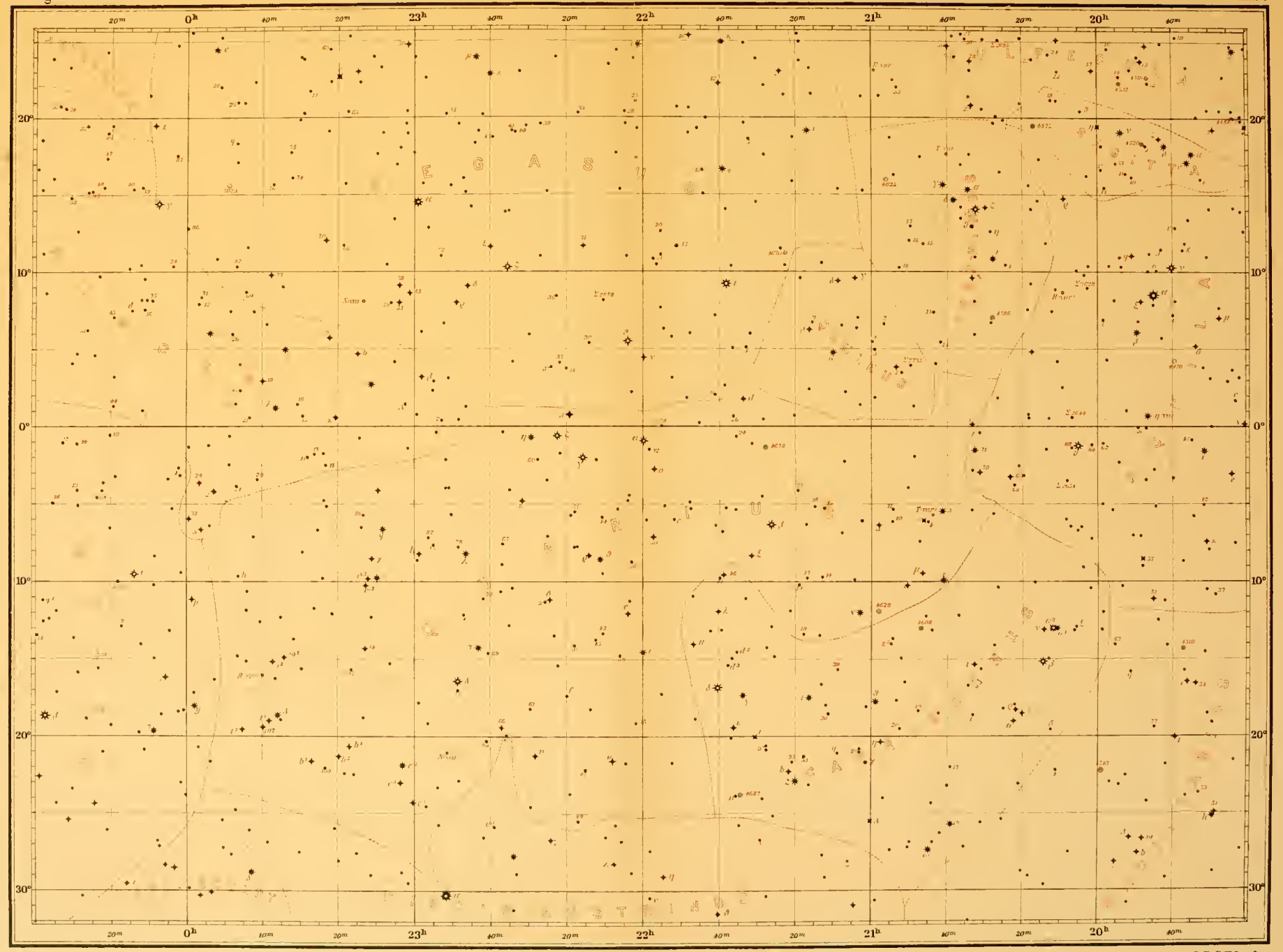

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The Star Clusters of the Pleiades.

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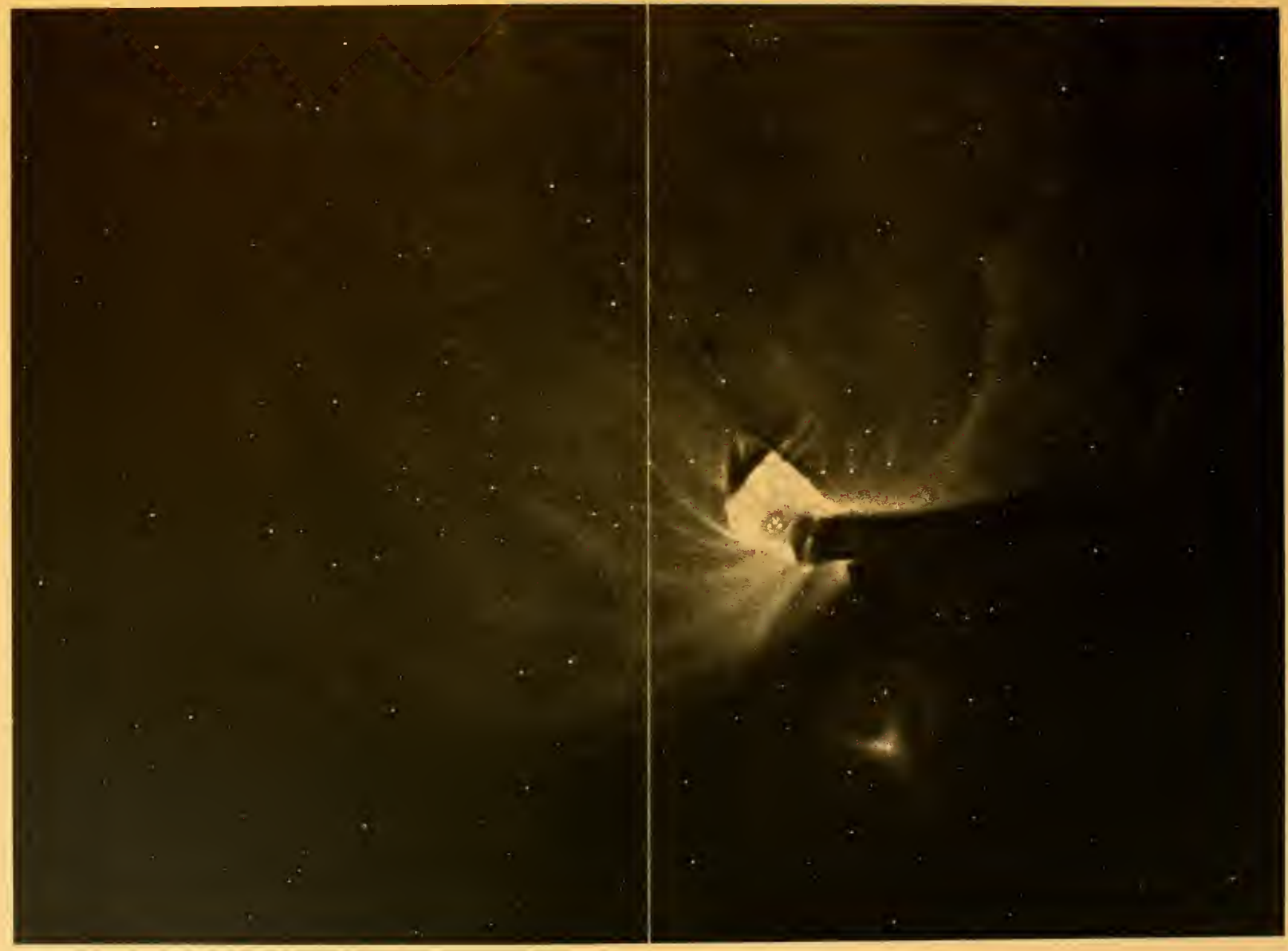

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The Great Nebula in Orion 1859—1863

after C. P. Bond.

Nebula G.C. 4355 after Trouvelot

Star Cluster G.C. 4294 after Trouvelot

Star Cluster G.C. 4440 after Vogel.

Star Cluster G.C. 1361 after Vogel

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I

Rt. Asc. $19^h\ 55^m$ Decl. $+\ 37^\circ\ 45'$.

Part of the constellation of the Swan (Cygnus)

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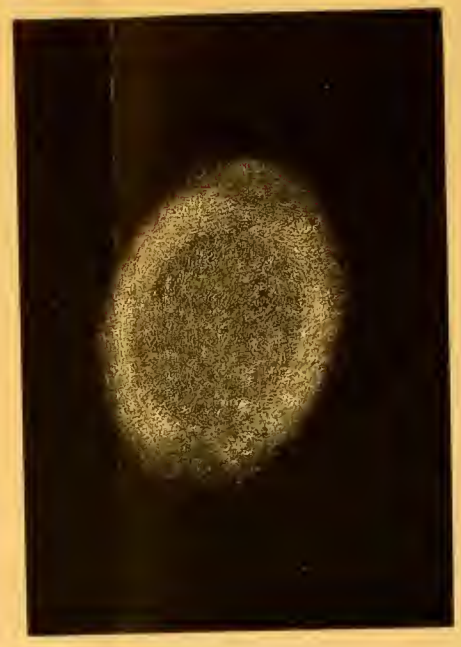

Ring Nebula in the Lyre (Lyra)
after Holden.
G. C. 4417.

The Omega Nebula after Holden and Trouvelot.
G. C. 4403.

Spiral Nebula
In the Hounds (Canes Venatici) after Rosse.
G. C. 3572.

Crab Nebula in the Bull (Taurus)
after Rosse.
G. C. 1157.

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G. C. 256, in Cassiopeia

G. C. 392, in Cassiopeia.

G. C. 512, 521, in Perseus.

G. C. 4230, in Herkules.

G. C. 4755, in the Lizard (Lacerta).

G. C. 5031, in Cassiopeia.

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Nebula G C. 1227 after Tempel.

⊛ Nova 1572 10 11 12 13 14 15 16

The New Star in Cassiopeia and its surroundings, after D'Arrest.

Nebula G.C. 3165 after Tempel.

Star Cluster G.C. 1295 after O. Lohse

Nebula G. C. 1511 after Tempel.

Nebula G. C. 4173 and its surroundings

The Nebulæ G. C. 3105, 3108, 3109 after Tempel.

Star Cluster G C. 4230 after Trouvelot

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